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GRADUATE SCHOOL OF NURSING, PhD PROGRAM

DISSERTATION DEFENSE

AN ANALYSIS OF SEVERAL DIMENSIONS OF PATIENT SAFETY IN AMBULATORY-CARE FACILITIES

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LINKING PAPER/EXECUTIVE SUMMARY: AN ANALYSIS OF SEVERAL DIMENSIONS OF PATIENT SAFETY IN AMBULATORY-CARE FACILITIES

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The current and intense focus on medical error and its deleterious impact on patients was primarily launched by the epidemiological research from the 1991 Harvard Medical Practice Study, the first major analysis of population estimates of medical error and its consequences. This study, along with a few others, was the basis for the Institute of Medicine's groundbreaking patient safety initiative, *To Err is Human, Building a Safer Health System*. The numbers cited in that publication---between 48,000 and 98,000 patients die every year as a result of medical error—hit the popular press and continue to be referenced to this day. Considerable research has been subsequently generated, primarily from inpatient venues. However**,** between 1983 and 1993 the number of ambulatory-care visits increased by 75%, while inpatient days fell by 21%.

This dissertation research addresses a much-needed focus on patient safety in ambulatory care. Within the broader framework of patient safety, a closer examination of medical error in ambulatory care reveals problematic areas related to missed or delayed diagnosis, incorrect treatments such as wrong drugs or dosages, and delayed or omitted treatments and preventive services. This research was framed by the work of theorist, Charles Vincent, who extended the seminal work of noted psychologist James Reason beyond the focus on errors at the "sharp end" to latent errors or background circumstances. Vincent focused on patient safety issues such as poor communication and supervision, excessive workload, and educational or training deficiencies. Operational measurement of these dimensions is accomplished by the use of safety-climate surveys, which offer a snapshot view of the aggregated-employees' attitudes at a distinct moment in time.

The specific aims of this study were to examine dimensions of safety in select Air Force ambulatory-care facilities and also compare four main primary-care professional groups in terms of these same dimensions of safety as well as collaboration and communication. The methodology for this research included the use of a well-established instrument, the Safety Attitudes Questionnaire (SAQ),

which was originally developed twenty years ago in the aviation industry. The SAQ is designed to measure safety climate in healthcare. It has sound, psychometric properties (Cronbach's Alpha .74 to .93) and an ambulatory-care version. Primary care staff from four Air Force ambulatory-care facilities in the Midwestern United States were surveyed for a total sample size (N) of 213 and an overall response rate of 65%. Specialty areas, ambulatory-surgical staff, administrative, and executive staff were excluded.

The first manuscript in this dissertation dossier has already been published in the Journal of Advanced Nursing Science as a paper of excellence on the topic of complex adaptive systems. A second manuscript elucidated the state of the science regarding medical-error-attribution theory, which guided this dissertation research conceptually and has direct applicability to managing patient safety from a nursing-administrator perspective. The second manuscript was submitted to the Journal of Nursing Administration. Three additional manuscripts were produced from this dissertation research and submitted to the Journal of Quality and Safety in Health Care, Military Medicine, and the Journal of Patient Safety. These manuscripts were directly related to the following research questions: Is there a difference among professional groups on their ratings of communication and collaboration? Is there a difference among professional groups on the total safety climate score and on the six subscales of safety climate? Finally, is there a difference among the four clinics on the total safety score and the six subscales of safety climate?

The third manuscript examined comparisons of collaboration and communication among nurses, nurse practitioners, pharmacists, and physicians. Unlike inpatient venues, collaboration and communication scores among nurses and physicians of each other in this study were rated comparably high 86% of the time. Surprisingly, however, pharmacists had the lowest overall score of all the professional groups**,** and pharmacists viewed other groups negatively as well. Pharmacists reported often being perceived by physicians as the "police, rather than colleagues." Also pharmacists reported significantly higher overall support from other pharmacy staff, higher morale, and were more likely to report making errors that had the potential to harm patients.

The fourth manuscript, submitted to Military Medicine for publication, addressed the comparison of the four clinics on the SAQ total safety scores and the six subscales of teamwork climate, job satisfaction, perceptions of management, safety climate, working conditions, and stress recognition. One clinic scored significantly higher than the other three clinics and was the only clinic to score in the positive range for safety climate. This clinic also scored significantly higher on five of the six subscales. An analysis of the major areas of difference revealed concerns related to the need for more manpower and training, less moving of staff by management between clinics in less than two years, and greater problem resolution on the part of management.

The final manuscript, submitted to the Journal of Patient Safety, addressed the comparisons of the professional groups on total safety and subscale scores. This component of the research revealed no significant differences among the professional groups. However, there were significant differences in the total safety scores and four of the six subscales when comparing the groups on the basis of age. As compared with staff aged 32 to 41, or those aged 42 to 63, the staff members 31-years-old and younger reported lower job satisfaction, less confidence in management, greater concerns about the resolution of disagreements, and uncertainty regarding the proper channels to use to direct questions regarding safety.

This research was limited in that it sampled only Air Force primary care staff and should certainly be replicated among Army, Navy and other civilian ambulatory care settings as well. The implications for management are striking in terms of identifying the needs and perceptions of staff who have not received as much attention such as the pharmacists, technicians, and younger staff within healthcare facilities. Programs and policies that aim to enhance teamwork should address the different paradigms and work experience of these various groups. Finally, research that examines more precisely conflict resolution within organizations as an aspect of safety culture would move healthcare into uncharted and potentially fruitful areas of exploration.

Complex adaptive systems: concept analysis

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Complex adaptive systems: concept analysis

Aim. The aim of this paper is to explicate the concept of complex adaptive systems through an analysis that provides a description, antecedents, consequences, and a model case from the nursing and health care literature.

Background. Life is more than atoms and molecules – it is patterns of organization. Complexity science is the latest generation of systems thinking that investigates patterns and has emerged from the exploration of the subatomic world and quantum physics. A key component of complexity science is the concept of complex adaptive systems, and active research is found in many disciplines – from biology to economics to health care. However, the research and literature related to these appealing topics have generated confusion. A thorough explication of complex adaptive systems is needed.

Methods. A modified application of the methods recommended by Walker and Avant for concept analysis was used.

Findings. A complex adaptive system is a collection of individual agents with freedom to act in ways that are not always totally predictable and whose actions are interconnected. Examples include a colony of termites, the financial market, and a surgical team. It is often referred to as chaos theory, but the two are not the same. Chaos theory is actually a subset of complexity science. Complexity science offers a powerful new approach – beyond merely looking at clinical processes and the skills of healthcare professionals.

Conclusion. The use of complex adaptive systems as a framework is increasing for a wide range of scientific applications, including nursing and healthcare management research. When nursing and other healthcare managers focus on increasing connections, diversity, and interactions they increase information flow and promote creative adaptation referred to as self-organization. Complexity science builds on the rich tradition in nursing that views patients and nursing care from a systems perspective.

Keywords: chaos, complex adaptive systems, complexity, nursing

Introduction

The question of what is life has plagued scientists and philosophers for centuries and was formulated by the ancient Greeks in terms of substance: What is life made of? What is its essence? The Greeks answered the question about substance in the sixth century with descriptions of the four fundamental elements: earth, air, fire, and water (Capra 1996). But the ancient Greeks also asked about form: How does life fit together? Form is ultimately a question of patterns. The question of substance leads one to focus on the pieces of the whole. The question of form leads one to focus on the whole. To answer the question about what is life, both substance and form must be considered. If we are concerned about the latter, that is, the question of form, then we ask not about individual parts, but about how the parts fit together in

relationship to each other; we ask about patterns. A focus on patterns has resulted in considerable analysis and research that is often referred to as systems thinking. The value of systems thinking was expressed by Capra (1996, p. 81), physicist and philosopher:

> From the systems point of view, the understanding of life begins with the understanding of pattern…or the configuration of ordered relationships…what is destroyed when a living organism is dissected is its pattern…while it is true that all living organisms are ultimately made of atoms and molecules, they are not 'nothing but' atoms and molecules. There is something else to life, something non-material, irreducible – a pattern of organization.

From this emphasis on pattern, that is characteristic of systems theory, has come the most recent generation of conceptualizing and modelling of living systems that now is known as complexity theory, complexity science, or in mathematical terms, non-linear dynamics (Capra 2002).

The concepts and perspectives from complexity science cross many disciplines – from physics to biology to chemistry and, more recently, to the applied sciences of management and health care. A survey of dissertations published between 1979 and 2003 with the subjects of complexity science, complexity theory, or complex adaptive systems reveals 51 titles that range from the emergence of languages as complex adaptive systems to genetic algorithms for agent evolution (UMI Dissertation Express 2004). Indeed, there are many who believe the ideas and principles in complexity science also resonate with and have value for the human social systems as well as the physical sciences (Lewin 1999).

From the early 1990s to the present day, the nursing, medical, and business literature reflects the fact that complexity science is no longer limited to the sciences of biology, physics, and mathematics from which it sprang (Stacey 1992, 1996, Plsek & Greenhalgh 2001, Anderson & McDaniel 2002, Haigh 2002, Anderson *et al.* 2003, Porter-O'Grady & Malloch 2003). Although there certainly is applicability of the concepts from complexity science to health care, greater clarity and precision is needed as the field develops so that common understandings and, ultimately, more research can emerge. For example, the terms complexity and chaos are often used interchangeably, and yet they are not synonymous (Cilliers 1998, Lewin & Regine 2001, McDaniel & Driebe 2001). And central to complexity science is the notion that groups of living beings or organizations, whether they are businesses or hospitals, can be described as complex adaptive systems. This concept is not captured by chaos theory.

Therefore, the aim of this paper is to contribute to the understanding of complex adaptive systems by explicating its components through a conceptual analysis. Currently, no concept analysis of complex adaptive systems exists in the literature. Rodgers and Knafl (2000) point out that the value of discussing concepts is the clarification and refinement that results with the subsequent contribution to the problem-solving efforts of a discipline.

This concept analysis will be constructed using the method recommended by Walker and Avant (1995). A modified application of their framework specifies the use of defining attributes, antecedents, consequences, and model cases. This paper will proceed using these guidelines to explicate the concept of complex adaptive systems.

Concept analysis

Historical review

To better understand the concept of complex adaptive systems, we must examine the intellectual history from which it springs. It is useful to put this evolving set of powerful ideas into an historical context to fully appreciate the state of the science in the early 21st century. Some major scientific developments have shaped and informed the historical framework of complexity science.

The first layer of this historical scientific framework emerged in the early decades of the 20th century. The work of physicists in quantum theory and the subatomic world of protons, neutrons, and electrons, based on the revolution in science begun by Albert Einstein, advanced science beyond the 18th century's emphasis on reductionism. In exploring the subatomic world, scientists made some startling discoveries: matter is not the hard mass that operates from the principles of gravity and Newtonian physics. Indeed, at the subatomic level, matter can take varying forms, either waves or particles. And what determines whether an electron is a wave or a particle depends upon the electron's relationship with other subatomic particles (Capra 1982). In addition, physicist and philosopher Capra (1996) also explained that the movement and positioning of subatomic particles cannot be precisely predicted and that dynamic interactions of continual movement characterize the world at the subatomic level. Quantum theory determined that particles can only be understood in terms of their movements and the resulting dynamics that occur as molecules interact. Capra (1982, p. 81) expressed this thought in poetic terms: 'As we penetrate into matter, nature does not show us any isolated basic building blocks, but rather appears as a complicated web of relations between the various parts of a unified whole'.

Another major contributor to complexity science was a seminal physicist, Ilya Prigogine, Belgian physicist and Nobel Prize recipient in 1977, who identified that the second law of

thermodynamics of inexorable decay and random disorder was not the complete story of how processes in nature operate. Prigogine and others in the 1960s identified that in the real world atoms and molecules are almost never left to themselves; if enough energy flows from the outside, the tendency to degrade is partially reversed, and indeed, a new pattern of complex structures will spontaneously organize (Waldrop 1992, Capra 1996).

Prigogine drew on the work of French physicist Henri Benard who discovered that heating a thin layer of liquid resulted in an organization of new structures. As heat increased on the liquid and reached a certain critical value, conduction was replaced by convection, and a striking pattern of hexagonal cells appeared that resembled honeycombs (Capra 1996). This process of increasing heat was described as moving the system far from equilibrium, meaning far from uniform temperature throughout the liquid, and into a 'critical point of instability, at which the ordered hexagonal pattern emerges' (Capra 1996, p. 87). This process of self-organizing is not limited to laboratory experiments. In addition, sand dunes and snowfields can show hexagonal patterns from the flow of warm air away from the surface.

Building on Prigogine's work on non-equilibrium thermodynamics and the principle of self-organization, other scientists have noted a particular characteristic of self-organization: no one external designer or manipulation from some centralized source of control directs these new patterns (Cilliers 1998). This aspect of the science is particularly characteristic of complex adaptive systems and is one striking example of how this new generation of systems theory differs from its predecessors of earlier decades.

Moving beyond physics and the work of Prigogine, Cilliers (1998), philosopher and research engineer in computer modelling, explained self-organization from the biological perspective. He noted that a system not only must receive, process, and retain information; it also must respond and produce some form of output as well. This process can result in a form of internal structure that is the result of complex interactions between the environment and the system's history and present state. For example, Cilliers (1998, pp. 88–90) cited the example of fish behaviour, which is also an example of a complex adaptive system:

> The condition of the fish would depend on a large number of factors, including the availability of food, the temperature of the water, the amount of oxygen and light, the time of the year, etc. As these conditions vary, the size of the school of fish will adjust itself optimally to suit prevailing conditions, despite the fact that each individual fish can only look after its own interests. The system of the school as a whole organizes itself to ensure the best match between the system and the environment. This organization is also adaptive in the sense that the school will be sensitive to changing conditions in the light of past experience. There is no agent that decides for the school what should happen, nor does each individual fish understand the complexity of the situation. The organization of the school emerges as a result of the interaction between the various constituents of the systems and its environment.

The final historical scientific layer that provided the foundation of complexity science involved the principles from chaos theory, most importantly that of non-linear relationships and actions. Specifically, Edward Lorenz, meteorologist at the Massachusetts Institute of Technology, in 1963 identified the impact of changing only a few decimals in weather modelling on the overall result. Lorenz ran his computer model of weather in the middle rather than at the beginning, and he used six decimals instead of three. These seemingly small changes had a large effect on the results and laid the groundwork for the mapping of chaos mathematically. The discovery was characterized as the fact that small changes in the initial characteristics of an active system can dramatically affect the long-term behaviour of that system. This is often referred to as the 'butterfly effect'. If a butterfly flaps its wings somewhere in the world today, there will be a hurricane somewhere else at some future point (Haigh 2002).

Indeed, weather is the classic example of the non-linear world, unlike the linear world of spacecraft trajectories that can be plotted and predicted. Weather has many components, interacting in ways that are impossible to predict in advance. Other examples of non-linearity abound: ecosystems, economic entities, developing embryos, the human brain: 'each is an example of complex dynamics that defy mathematical analysis…' (Lewin 1999, p. 11).

This concept of non-linear relationships has been a large component of the application of this emerging science of complexity in economics, biology, and meteorology. Non-linear relationships are often the major concept used when scientists discuss chaos theory. However, although mathematical descriptions of non-linear relationships are quite valuable, they do not capture the structure and organization that is characteristic of complexity science in general and complex adaptive systems in particular.

It is not uncommon to see chaos and complexity used as synonyms, although Cilliers (1998) would argue that they are not the same. Specifically, chaos theory has much to say about the sensitivity to initial conditions; whereas with complexity there are always a large number of interacting components that are not so affected by initial conditions. Cilliers (1998, p. ix, 13) elaborates:

It is exactly the *robust* (italics in the original) nature of complex systems, their capacity to perform in the same way under different conditions, that ensures their survival…My claim is rather that chaos theory…does not really help us to understand the dynamics of complex systems…it is probably most appropriate to say that chaos is a subset of complexity.

Other writers have validated Cilliers's point that complexity speaks to the order that emerges from a large number of interacting members of a system (McDaniel & Driebe 2001).

Defining attributes

A critical component of a conceptual analysis, according to Walker and Avant (1995), is the identification of defining attributes. For the concept of complex adaptive systems, Plsek and Greenhalgh (2001, p. 625) provided a useful definition:

A complex adaptive system is a collection of individual agents with freedom to act in ways that are not always totally predictable, and whose actions are interconnected so that one agent's actions changes the context for other agents. Examples include the immune system, a colony of termites, the financial market, and just about any collection of humans, for example…a primary healthcare team.

The attributes and precise characteristics of a complex adaptive system are elucidated by Cilliers (1998, p. 3–5) to include the following:

- A large number of elements interact in a dynamic way with much exchange of information.
- These interactions are rich, non-linear, and have a limited range because there is no over-arching framework that controls the flow of information.
- Complex systems are open systems with feedback loops, both enhancing, stimulating (positive) or detracting, inhibiting (negative). Both kinds are necessary.
- Complex adaptive systems operate under conditions far from equilibrium, which means there is continual change and response to the constant flow of energy into the system. 'Equilibrium is another word for death' (p. 4).
- Complex systems are embedded in the context of their own histories, and no single element or agent can know, comprehend, or predict actions and effects that are operating within the system as a whole.
- Complexity in the system is a result of the patterns of interaction between the elements.

More than one author has cited free-market economies as classic examples of complex adaptive systems (Cilliers 1998, Rouse 2000). Within the international flow of money, goods and services, large numbers of independent agents act, learn, and adapt. These agents respond to rules and regulations, but there is no centralized command and control; furthermore, non-linear interactions are not uncommon. Frequently a small investment can reap a big reward. In addition, the human brain also is an example of a highly complex adaptive system with many interconnections and feedback loops. By contrast, a snowflake has an elaborate and beautiful pattern with a large amount of elements interacting within its structure. There is no external decision as to the position of the molecule in the snowflake, but there are no feedback loops and no evolution. A snowflake is not an open system; it cannot adapt to its environment. 'A snowflake, although wondrously complex in appearance, is only complicated' (Cilliers 1998, p. 5).

Antecedents and consequences

Two other important components in a conceptual analysis are the identification of antecedents and consequences, according to Walker and Avant (1995). The major antecedents in a complex adaptive system are the individual agents: for example, the people who make up the staff of a hospital or a cultural group, the ants in an ant colony, the individual cells that comprise the human immune system. However, the agents also must be able to interact; a large number is a necessary, but not a sufficient condition. Grains of sand on a beach do not constitute a complex adaptive system. A large number of agents with the potential to interact constitute the major antecedent required for complex adaptive systems.

Adaptation (or emergence, in the language of complexity) is the major consequence. Emergence is often referred to as a holistic phenomenon because the whole is more than the sum of the parts and is produced when agents interact and mutually affect each other (Lewin 1999, Lewin & Regine 2001). Emergence is also enhanced by diversity because of the greater interaction and richer patterns. Emergence is also often seen in crises – when groups rise to the occasion to organize and adapt to the demands of the hour. The challenge of management in nursing and health care is to cultivate creative, emergent behaviour in times that are not crises.

Model case

Walker and Avant (1995) recommended the description of a model case to capture the critical attributes of the concept under study. The model case cited below came from the healthcare literature.

Horbar *et al.* (2001) and a team of 16 researchers, representing a spectrum of specialties (to include several

nurses), designed a study of outcomes for patients that focused on neonatal intensive care using a multidisciplinary collaborative improvement model. Collaborative improvement as a model has been used successfully by single units or service-based teams within single institutions. This study built on that previous research by examining collaboration among a number of institutions and was a stronger design because it included a large comparison control group.

The 10 self-selected neonatal intensive care units (NICUs) were divided into two subgroups, with six NICUs targeting nosocomial infection, as measured by rates of coagulase-negative staphylococcal or other bacterial pathogens. The remaining four intervention groups focused on chronic lung disease, as measured by either death or the requirement for oxygen supplementation at 36 weeks' adjusted gestation age. Sixty-six other NICUs served as the comparison control group. The patients were infants with birth weight 501–1500 g, born at or admitted within 28 days of birth between 1994 and 1997. The 10 intervention NICUs had a total *n* of 3800 patients; the 66 control NICUs had a total *n* of 21,509 patients.

The intervention was the formation of multidisciplinary teams, who were directed by a trained facilitator over a 3-year period beginning in 1995. The teams received instruction in quality improvement, identified common goals, implemented practices based on literature reviews and conducted site visits to other medical centres, both those participating in the study and those with documented superior performance. This research was structured within the working and stated assumption that healthcare organizations are examples of complex adaptive systems.

The teams were encouraged to develop a collegial atmosphere that focused on creating uniform protocols which were most relevant to their specific units and were able to adapt 'potentially better practices' (quotations in original). The range of practices identified as useful to improve patient outcomes included: minimizing intubation days and reducing the number of heelsticks for laboratory testing. Moreover, Horbar *et al.* (2001, p. 17) noted two important interventions related to the unit culture: '(promote) developmentally supportive care, with an emphasis on minimal handling; and develop and maintain a culture of cooperation and teamwork that supports and encourages all team members to feel responsible for outcomes'.

This study documented significant improvement in patient outcomes with this collaborative improvement model compared with the control groups. Specifically, the rate of infection with coagulase-negative staphylococcus decreased in the six experimental NICUs from 22·0% to 16·6% ($P = 0{\cdot}007$). For the infants in the chronic lung disease category, the rate of supplemental oxygen at 36 weeks' adjusted gestational age decreased from 43·5% to 31·5% for the experimental NICUs ($P = 0{\cdot}03$).

The big message and finding from this study was not the merit of any particular clinical practice that improved patient outcomes. Instead, the process was the point. The authors eloquently stated: 'If any inference can be drawn, it is that active participation in structured multidisciplinary, cross-institutional, collaborative learning that leads to focused changes in local practice can lead to improvements in clinical outcomes…Such participation may…be as or more important than the specific clinical practices implemented (Horbar *et al.* 2001, p. 20). The research results, although more modest than the projected goals at the beginning of the study, did validate the findings from previous research that collaborative quality improvement interventions can positively affect patient outcomes.

How does this study qualify as a model case of complex adaptive systems? It involved numerous agents who self-organized in order to consciously improve the rich interactions and interconnections that already existed in hospitals. There was much emphasis on the group as the tool of intervention, as opposed to a single provider or leader. No one predicted or controlled the results of these interactions. However, these collaborations were behaviours that constituted positive adaptations to the healthcare challenges presented by neonates. Those involved in the application of the principles of complex adaptive systems to hospital settings recommended that the goal of leaders should be to build relationships as a key method to solving problems (Anderson & McDaniel 2002).

Relevance to nursing

Complexity science is an exciting new chapter in the book of systems thinking and, as such, has considerable relevance to nursing. Systems thinking has a rich tradition in nursing. A systems perspective was articulated in the mid-20th century in the United States of America (USA) by Dorothy Johnson, who introduced a behavioural system model in 1959 (Fawcett 2000). Johnson's model emphasizes holism – individuals are active, not reactive, and adjust to their environments. The role of nursing is to supply assistance to individuals and families with disturbances in systems balance.

Additional US nurses continued the tradition of articulating a systems view of the world and nursing. Imogene M. King proposed a General Systems Framework in the mid-1960s that discussed three interacting systems – the person, the interpersonal, and the social system. She emphasized that such systems are open, dynamic, and interacting, connected by communication links (Fawcett 2000).

What is already known about this topic

- Complexity science is an emerging field in a wide range of disciplines, from physics to biology to health care.
- Diverse agents interact in unpredictable, interconnected ways that cannot be controlled in a centrally managed manner.
- Interactions produce creative adaptations that emerge, often during times of great change or crisis, referred to as the 'edge of chaos'.

What this paper adds

- Complex science and chaos theory are often used interchangeably; they are not the same.
- Chaos theory is a subset of complexity science.
- Healthcare leaders will enhance patient care outcomes if they focus on relationships and develop connections among staff. Patient outcomes are enhanced when these principles are applied.

Martha E. Rogers advanced systems thinking in US nursing with her 'Science of Unitary Human Beings' that was presented at a major conference in 1978. Although more abstract than earlier models, Rogers drew on an understanding of physics by discussing energy fields and the notion that the person and the environment are irreducible, indivisible wholes (Fawcett 2000).

Finally, Sister Callista Roy, with her Adaptation Model developed in the early 1970s, also built on earlier general systems theory and the work done by Dorothy Johnson. Roy acknowledged the growing body of knowledge in quantum physics by noting that living systems were both non-linear and complex processes of interaction.

This rich tradition in nursing that has emphasized connections and interactions within a systems paradigm continues today. Complexity science merely represents the next stage in understanding how systems operate. Anderson and Issel, both professors of nursing, and McDaniel, professor of management (2003), advanced the tradition of systems research with their studies that investigated complexity science. For example, these researchers identified nursing homes as complex adaptive systems. They hypothesized that management practices that encouraged interaction, learning, and innovation facilitated the development of relationships and cooperation among staff in nursing homes, and these relationships ultimately affected patient care outcomes. Anderson *et al.* (2003) measured communication openness and participation in decision-making among other variables and correlated these with nursing home resident outcomes such as complications of immobility and fractures. The findings supported the hypothesis that management practices that facilitate self-organization contribute to better resident outcomes.

An additional example of a real-life hospital environment and a nurse leader implementing the principles of complexity science was described by Lewin and Regine (2001). The writers identified a hospital in north-central New Jersey that was led by a chief executive officer who believed in the principles of complexity science.

The director of nursing also believed that the principles of complexity science could help solve tough problems, and she tackled the issue of long admission times using those concepts. In the early 1990s at this hospital, it could take up to 20 hours between the time patients entered the hospital until the time they received a first dose of antibiotics. Obviously, this was unacceptable. She set up a task force made up of volunteers from all departments because diverse elements are critical to effective self-organization. Only one simple rule was laid down for the task force: all admissions were to be done within an hour. Within 3 months, admissions were down from 20 hours to 80 minutes through a pilot project known as 'express admissions' (Lewin & Regine 2001, p. 80). The leadership approaches involved in creating this success included 'direction without directives…listening to the front-line people…support along the way, and…getting out of their way' (Lewin & Regine 2001, p. 81). Such results indicate the value of empowering a diverse group with less control and direction from the top so that intense interactions could produce creative results. Although empowerment is not a new idea, complexity science helps us better understand why it works.

Conclusions

In summary, the concept of complex adaptive systems is crucial to an adequate understanding of the emerging field of complexity science. The concept represents the dynamic interactions of diverse agents who self-organize and produce adaptations that emerge in ways that can neither be predicted nor controlled. Applications in health care and management have been studied and validated in the literature. The application of the understanding of health care as a complex adaptive system involves cultivating an environment of listening to people, enhancing relationships, and allowing creative ideas to emerge by creating small non-threatening changes that attract people.

The ancient Greeks taught us to look for patterns in life and nature. Nursing has a long, rich tradition of appreciating patterns, of recognizing and valuing systems. An

understanding of complex adaptive systems will no doubt serve nursing and health care in the 21st century.

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Dissertation Proposal

An Analysis of Dimensions of Patient Safety In Ambulatory-Care Facilities

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BACKGROUND

Fifteen years have passed since the Harvard Medical Practice Study was published--major research that established the extent of the problems of adverse events experienced by patients in hospitals. This seminal work was the first major analysis of population estimates of medical error and the subsequent consequences. The results were staggering: 3.7 % of patients admitted to New York non-psychiatric hospitals in 1984 experienced an adverse event, with 13% resulting in death (Brennan, et al., 1991). This study, along with a few others, was the basis for the Institute of Medicine's seminal work in the area of patient safety called *To Err is Human, Building a Safer Health System* (Kohn, et al., 2000). The numbers cited in that publication---between 48,000 and 98,000 patients die every year as a result of medical error—hit the popular press and continue to be referenced broadly to this day.

Congress responded to these reports by directing action on the part of the Agency for Healthcare Research and Quality (AHRQ). Specifically the Senate Committee on Appropriations in the Committee's Report 106-293, dated May 12, 2000, directed that the Director of AHRQ should "establish a competitive demonstration program for health care facilities and organizations in geographically diverse locations, including rural and urban areas, to determine the causes of medical errors"(US Department of Health and Human Services, AHRQ, http://www.ahrq.gov/qual/pscongrpt/psini1.htm). By 2003 funding for patient-related studies through AHRQ totaled more than 69 million dollars. The instrument proposed for this research was developed through this program of grants at AHRQ.

However there has been incongruence between the venue of patient safety research and the venue for the majority of patient care. Much of the research literature comes predominantly

from hospitals and the experience of hospitalized patients. This is despite the enormous shift in care from inpatient venues to ambulatory care. Approximately 25% of the U.S. population visits a physician's office as compared to 8% who are hospitalized. Less than 1% of patients are hospitalized in academic medical centers, which is frequently the site of research on medical error (Green, Fryer,Yawn, Lanier & Dovey, 2001).

In addition three-fourths of all medical procedures are now performed in ambulatory settings, including the number of outpatient surgeries, which increased from 3 to 27 million operations between 1980 and 1995. Between 1983 and 1993 the number of ambulatory care visits increased by 75% while at the same time inpatient days fell by 21% (Phillips, Christenfeld, & Glynn,1998). And the risk for death is high in the outpatient venue as well. The number of outpatient deaths rose 8.5 times, greater than the 2.4 fold increase for inpatient deaths. An examination of a risk-management database compiled at an academic medical center over 5 years determined that the rate of adverse events was 3.7 per 100,000 clinic visits (Fisher, Fetters, Munro, & Goldman, 1997). Specific challenges associated with ambulatory care include early discharge from the hospital, the prescribing of potentially dangerous drugs, the pressure of short consultations, and the increasingly fragmented nature of services, all of which increase the risk in the outpatient setting (Wilson, Pringle, & Sheikh, 2001, p. 583).

In addition the diversity, scope, and differences related to organization and infrastructure may make the ambulatory care venue more vulnerable to error than hospital-based care, which is highly regulated and characterized as being procedure-driven (Dovey, Meyers, Phillips, Green, Fryer, & Galliher, et al., 2002). The very nature of medicine in primary care is episodic by definition, characterized by patients presenting with early manifestations of illness and often

within the context of psychosocial problems and other physical co-morbidities (Jacobson, Elwyn, Robling, & Jones, 2003).

Although the acuity is high among hospitalized patients, and therefore the risk for both error and bad outcomes is high, the major focus regarding patient safety on hospitals is tantamount to missing obvious opportunities for quality improvement initiatives where the majority of patients receive their care each day.

When one examines the research that has been completed on error in ambulatory care, the studies are few, but the results are consistent. A major synthesis of the research in ambulatory care error resulted in a taxonomy developed by Elder and Dovey (2002) that included three categories of preventable adverse events: diagnosis, treatment, and preventive services. Examples include a missed or delayed diagnosis, an incorrect drug or dose, or delayed or omitted administration of a treatment or drug. These categories describe what went wrong. In terms of why something went wrong, these are classified as process errors and can be broken down into clinician factors (clinician took an inadequate history), communication factors, administration factors, and blunt-end factors. The latter were defined as insurance company and government regulations, physical size and location of practice, and the general health care system. Communication factors have been a theme in a number of studies of error in ambulatory care, including the correlation with high severity outcomes and death (Phillips, Bartholomew, Dovey, Fryer, Miyoshi, & Green, 2004; Bhasale, Miller, Reid, & Britt, 1998).

CONCEPTUAL MODEL

The research on causes and contributing factors to error in ambulatory care is not unlike the research findings from hospitals, and indeed in other fields such as aviation, in its breakdown

between system and individual errors. This spectrum of error can range from management decisions regarding staffing and training, to team factors that either promote or inhibit good communication, to individual factors such as knowledge and skills or personal stress and health. These factors line up with the breakdown in system defenses that could prevent or mitigate error, not unlike holes in a piece of Swiss cheese can line up to provide a trajectory of error and subsequent actual or potential harm to patients.

Such a systems model of error was described by British cognitive psychologist James Reason in his seminal work *Human Error* (1990). Reason made the observation that human contributions to system disasters are of two kinds: active errors which have immediate effects and latent errors, which may lie dormant with the system for a long time and only become evident when they combine with other factors to breach the system's defenses. These latent errors are related to actions removed from time and place from the actual time and place of the error and can be attributed to high-level decision makers, designer, and managers (Reason, 1990, p. 173). Reason's constructs of active and latent errors permeate the safety literature.

Reason made the illuminating analogy between human error in systems and the presence of resident pathogens in the human body. Such pathogens, or man-made destructive agencies which are part of every system, are present before an accident sequence begins. These pathogens are tolerated, detected, and corrected in systems, not unlike the auto-immune physiological defenses. But assuming the right set of circumstances and the existence of local triggers that interact with the pathogens in often unlikely ways, the systems defenses can break down and error occur (Reason, 1990). Likewise, the "pathogens" related to unsafe acts can also be those in the human condition: being stressed, unaware, unmotivated, and failing to perceive

hazards. Again even the best organizations cannot eliminate these precursors to unsafe acts, but they can provide adequate defenses to mitigate their effects.

Reason's work has had a profound effect on the conceptualizing of researchers in patient safety, and the concepts of active and latent error are ubiquitous in the healthcare research. A British colleague, psychologist Charles Vincent, built on Reason's model and elaborated on it with particular reference to health care and produced the following conceptual model which is the basis for this research:

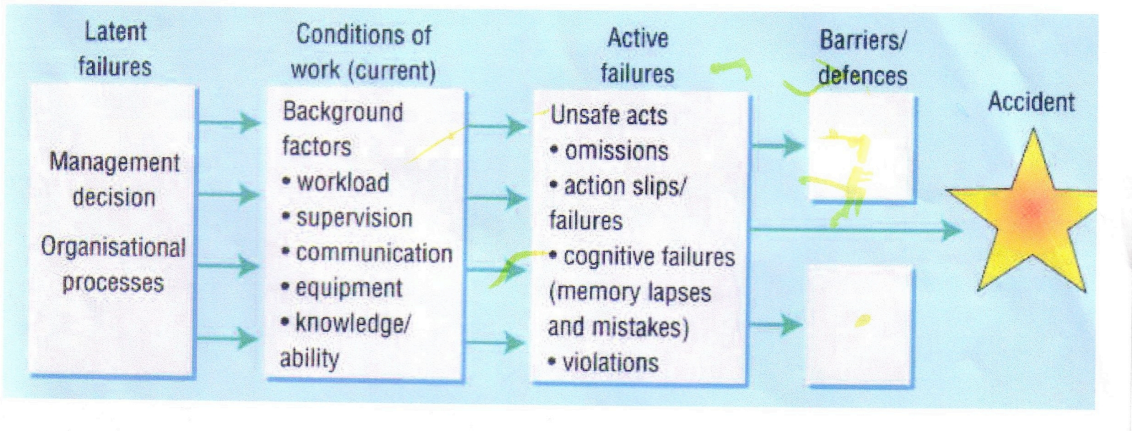

Figure 2. Organizational accident model based on work by Reason (Vincent, 1998, p. 1154)

The relationship between latent failures that are related to such factors as management and organizational processes and to subsequent conditions of work are laid out in this visual model developed by Vincent. These latent failures act as precursors to the active failures of individuals that operate at the sharp end, or that are directly involved in an actual mistake. The absence or the breakdown of defenses that prevent or mitigate problems usually precede errors.

One example of this sequence would be the decision by management to provide insufficient staff to a women's health clinic which daily performed pap smears to detect cancer. The insufficient manning resulted in a poor process for handling pap specimens and ensuring results were received by the providers and the patients notified. The few staff that were assigned to the

clinic were stressed and fatigued from the work load. This administrative weakness and staff factors of fatigue resulted in the failure to notify several patients of abnormal results and ensuring appropriate follow-up. Two of these patients subsequently died from cancer. Thus management or systems issues can produce a poor work environment and that in combination with individual error can result in bad outcomes related to error.

Charles Vincent's work in the field of medical error evolved, and he more explicitly drew on the theoretical foundation and vocabulary of error laid down by James Reason. For example, in a 1995 article on investigating accidents, Vincent refers to active and latent failures, and he makes a classic Reason observation: "Because many accidents are precipitated by latent failures it is unreasonable to blame those at the "sharp end" (quotations in the original) who are in a sense victims of other people's prior decisions" (Vincent, 1995, p. 395). He also reiterates Reason's observation that one cannot eliminate blame or individual responsibility altogether because there are incidences of consistent violations or neglect of responsibilities, which warrant disciplinary action. Vincent goes on to apply Reason's method by examining an individual case in depth and subsequently identifying several latent errors: inadequate training, confusing protocols, impaired staff communication, the need for team building, and greater supervision by senior staff at night. Vincent was one of the first writers on error to apply Reason's work directly to the medical field.

In 1995 Vincent edited a book entitled *Clinical Risk Management.* In that work Vincent not only addresses issues related to risk management over its 15-20 year history, but he also references work done by Reason in 1990 and to elaborate on that structure of latent and active errors:

> . . .. clinicians were asked to discuss not only errors that are made, but also

> the background circumstances which predispose to errors and accidents. Thus the background causes of adverse events will include the characteristics of the patient and their condition, but may also involve such factors as the use of locums, communication and supervision problems, excessive workload, educational, and training deficiencies, and so on. (Vincent, 1995, p. xix).

An example of these underlying clinical problems was illustrated in research conducted by Meurier, Vincent, and Parmar on errors in nursing practice (1997). This team surveyed 145 British nurses, using a modified 22-item questionnaire developed by Wu for studying medical mistakes. The findings substantiated the concept of contributing factors. Specifically the nurses surveyed identified stressful atmosphere, job overload, lack of knowledge and experience, and inadequate supervision and support from senior staff as factors that contributed to their errors (Meurier, et al.).

Vincent specified that the local climate is defined as conditions of work, such as workload, supervision, communication, equipment, knowledge, and ability. These conditions of current work for Vincent are consequences of management decisions and organizational processes that define the originating latent failures (Vincent, 1998).

The active failures according to Vincent's model were unsafe acts such as omissions and slips, failures or mistakes, and finally violations. Of course, the latent failures, conditions of work, and active failures could not have produced an accident without the failure of barriers and defenses.

Vincent goes on to state that there is a hierarchy of factors that is applicable to medicine that is not captured by Reason's model. He subsequently referred to this list as a framework of

contributory factors based on Reason's model of organizational accidents (Vincent, 2003). These factors that influence clinical practice, according to Vincent (1998), are the following:

institutional context (economic and regulatory contexts); organizational and management factors (policy standards, safety culture and priorities);

work environment (staffing levels and skills mix, workload and shift patterns, design, availability and maintenance of equipment, administrative and managerial support);

team factors (verbal communication, written communication, supervision and seeking help, team structure);

individual or staff factors (knowledge and skills, motivation, physical and mental health);

task factors (design and clarity of structure, availability and use of protocols, availability and accuracy of test results);

patient characteristics (condition, language and communication, personality and social factors).

Second, Vincent recommends considering the salient clinical events or the condition of the patient at the time of the adverse event, beyond the care-management problem. For example was the patient bleeding or in great distress? Finally, Vincent states that the investigator should consider the conditions in which errors may occur within the organizational context. This larger context is called the contributory factors by Vincent. An example of such a contributory factor would be whether or not the test results were unavailable because of poor record keeping processes. Or was there inadequate supervision or poor communication among staff members or

insufficient staffing? As Vincent observes, "Any combination of these factors can contribute to the occurrence of a single care-management problem" (Vincent, 2003, p. 1053). And contributing factors can be rare or chronic features of the organization. For example if there was a failure of communication, is this a common problem? If the problems are common, the incident points to a wider systemic problem that needs to be addressed, according to Vincent (2003 a).

This model corresponds to the broad concept of safety culture that exists in organizations in that it supports the notion that the spectrum of factors---organizational and individual---contribute to error and are crucial to understanding error. The eminent researcher in patient safety, Lucian Leape, made the link between the systems involved in error and the culture in healthcare facilities that produce them. Specifically in 1994, in a *Journal of the American Medical Association* article called Error in Medicine, Leape stated--

> But it is apparent that the most fundamental change that will be needed if hospitals are to make meaningful progress in error reduction is a cultural one. Physicians and nurses need to accept the notion that error is an inevitable accompaniment of the human condition, even among conscientious professionals with high standards. Errors must be accepted as evidence of systems flaws not character flaws. (Leape, 1994, p. 1857)

INSTRUMENTS THAT MEASURE DIMENSIONS OF PATIENT SAFETY

These dimensions of safety have been operationalized and measured by a variety of instruments that have been developed to identify the climate of safety within health care

facilities. Specifically Colla, Bracken, McKinney, and Weeks (2005) compared the general characteristics, dimensions, and psychometrics of nine surveys. These evaluators make the important distinction between safety culture and safety climate. The latter is considered the measurable forms of the former. Measurable factors include management behaviors, safety systems, and employee perceptions of safety (Colla, et al.). The authors drew the nine surveys from a Medline search, excluding those that measured general organizational climate and organizational aspects of employee safety. Of the nine surveys examined, seven targeted individuals while two were designed for teams. These latter two surveys were Strategies for leadership: An organizational Approach to Patient Safety (SLOAPS) and Medication Safety Self Assessment (MSSA). The five dimensions evaluated for seven of the nine safety climate surveys were leadership, policies and procedures, staffing, communication, and reporting (Colla, et al.).

Of the nine surveys examined, only four reported "comprehensive and sound" psychometric testing: Veterans Administration Patient Safety Culture Questionnaire (VHA PSCQ); the Hospital Transfusion Service Safety Culture Survey (HTSSCS); the Hospital Survey on Patient Safety (HSOPS); and the Safety Attitudes Questionnaire (SAQ) (Colla, et al., 2005, p. 364). According to the evaluation of these researchers, the SAQ, which has been used to compare the safety climate in a health care setting with that in aviation, was the only instrument that examined the relationship between patient outcomes and safety climate scores (Colla, et al.). Specifically, the authors of the SAQ reported that improved safety climates are associated with reductions in medication errors and with shorter lengths of stay (Sexton, Thomas, Helmreich, Neilands, Rowan, & Vella, et al., 2004).

In addition Colla, et al., (2005) recommend that those interested in safety surveys should use instruments with strong reliability and validity that are derived from sound psychometric testing.

The selection of a survey instrument should also be driven by the specific setting in which the evaluation and subsequent interventions will occur. For example if one is interested in Intensive or Ambulatory Care, then one should choose an instrument targeted to that setting. With this data on comparison of surveys, the Safety Attitudes Questionnaire is an obvious choice to use for evaluating patient safety climate in Air Force Ambulatory Care facilities because of its strong psychometric measures and its version that targets ambulatory care. Approximately two-thirds of Air Force Medical Service facilities are ambulatory care sites, so a survey tool designed for such environments is clearly preferable. An additional advantage of the SAQ is that it is available in the public domain since it was developed as part of a grant from the Agency for Healthcare Research and Quality (Sexton, et al., 2004).

The SAQ has established that there are differences between nurses and physicians in their attitudes toward each other regarding collaboration and communication (Thomas, Sexton, & Helmreich, 2003). In addition the SAQ has been utilized to validate that medical personnel are more likely to deny that fatigue affects their performance than pilots (Sexton, Thomas, & Helmreich, 2000). Neither question has been studied using the SAQ with a sample of Air Force medical personnel in the ambulatory-care venue.

The SAQ was developed utilizing Vincent's model of error, and the relationships among the components of the model and the six subscales measured by the SAQ are listed in the table below.

LINKAGES BETWEEN THE MOST APPROPRIATE

INSTRUMENT, THE SAQ, AND VINCENT'S CONCEPTUAL MODEL

Safety Attitudes Questionnaire And Vincent's Model						
SAQ Factors			Vincent Factors			
Subscales	Item #	Item Text	Latent Failure Mgmt/Org.	Conditions of Work	Active Failures	Contributory Factors
SAQ Teamwork Climate	3	Nurse input is well received in this office		X		X
	19	Decision making in this office utilizes input from relevant personnel.		X		X
	24	In this office, it is difficult to speak up if I perceive a problem with patient care.		X		X
	30	Disagreements in this office are resolved appropriately (i.e., not who is right, but what is best for the patient)		X		X
	38	The physicians and nurses here work together as a well-coordinated team.		X		X
	39	I am frequently unable to express disagreement with staff physicians/intensivists in this office		X		X
SAQ Safety Climate	4	I would feel safe being treated here as a patient.	X			X
	5	Medical errors are handled appropriately in this office.	X			X
	11	I receive appropriate feedback about my performance.	X			X
	20	I am encouraged by my colleagues to report any patient safety concerns I may have	X			X
	21	The culture in this office makes it easy to learn from the errors of others.	X			X
	28	I know the proper channels to direct questions regarding patient safety in this office.	X			X
	55	Personnel frequently disregard rules or guidelines that are established in this office.	X			X
SAQ Perception of Management	9	Senior management of this office is doing a good job.	X			X
	10	The management in this office supports my daily efforts.	X			X
	17	Office management does not knowingly compromise the safety of patients.	X			X
	26	I am provided with adequate, timely information about events in the office that might affect my work.	X			X
	45	Attending physicians/primary care providers in this office are doing a good job.	X			X
SAQ Job Satisfaction	2	I like my job.		X		X
	8	Working in this office is like being part of a large family.		X		X
	15	This office is a good place to work.		X		X
	29	I am proud to work at this office.		X		X
	41	Moral in this office is high.		X		X
SAQ Working Conditions	6	This office does a good job of training new personnel.		X		X
	7	All the necessary information for diagnostic and therapeutic decisions is routinely available to me.		X		X
	14	Briefings are common in this office.		X		X
	18	The levels of staffing in this office are sufficient to handle the number of patients.		X		X
	22	This office constructively deals with problem physicians and employees.		X		X
	23	The medical equipment in this office is adequate.		X		X

	35	It is easy for personnel in this office to ask questions when there is something they do not understand.		**x**		**x**
	42	Trainees in my discipline are adequately supervised.		**x**		**x**
	51	There is widespread adherence to clinical guidelines and evidence based criteria in this office.		**x**		**x**
SAQ Stress Recognition	**25**	When my workload becomes excessive, my performance is impaired			**x**	**x**
	31	I am less effective at work when fatigued.			**x**	**x**
	32	I am more likely to make errors in tense or hostile situations.			**x**	**x**
	36	Disruptions in the continuity of care can be detrimental to patient safety.			**x**	**x**
	44	I have made errors that had the potential to harm patients.			**x**	**x**
	56	Fatigue impairs my performance during emergency situations (e.g., emergency resuscitation, seizure).			**x**	**x**
Not Categorized	**1**	High levels of workload are common in this office.				
	12	In this office it is difficult to discuss errors				
	13	Briefing other personnel before procedure (e.g. biopsy) is important for patient safety.				
	16	Communication breakdowns which lead to delays in delivery of care are common.				
	27	I have seen others make errors that had the potential to harm patients.				
	33	Stress from personnel problems adversely affects my performance.				
	34	I have the support I need from other personnel to care for patients.				
	37	During emergencies, I can predict what other personnel are going to do next.				
	40	Truly professional personnel can leave personal problems behind when working.				
	43	I know the first and last names of all the personnel I worked with during my last shift.				
	46	All the personnel in this office take responsibility for patient safety.				
	47	I feel fatigued when I have to get up I the morning and face another day on the job.				
	48	Patient safety is constantly reinforced as the priority in this office.				
	49	I feel burned out from work.				
	50	Important issues are well communicated at shift change.				
	52	I feel frustrated by my job.				
	53	I feel I am working too hard on my job.				
	54	Information obtained through incident reports is used to make patient care safer in this office.				
	57	Fatigue impairs my performance during routine care.				
	58	I am satisfied with the current referral process in this office.				
	59	There is adequate and timely transfer of patient information between the primary care physicians and the specialist.				
	60	Medications are refilled in a timely manner.				
	61	Medications are refilled correctly.				
	62	Abnormal test results are frequently lost or overlooked.				

MILITARY RELEVANCE

The Department of Defense(DoD) has placed tremendous emphasis on patient safety, especially since Congress mandated a centralized process for reporting, compiling and analyzing medical errors in the 2001 National Defense Authorization Act (https://patientsafety.satx.disa.mil).

The goal of the DoD Patient Safety Program (PSP) is to avoid medical harm and improve patient safety by focusing on improving systems and communication among health care teams. The centralized DoD PSP is located in the TRICARE Management Activity (TMA) Office of the Chief Medical Officer with oversight of the Patient Safety Center data repository, located at the Armed Forces Institute of Pathology; the Center for Education and Research in Patient Safety (CERPS), located at the Uniformed Services University of Health Sciences (USUHS); Service PSP coordination, and the Healthcare Team Coordination Program (HCTCP). The objectives of the PSP are to improve the coordination of patient safety activities across the services, develop an analysis plan for patient safety data to uncover opportunities for improvement in the military health system; create a culture of trust in reporting medical errors, and increase patient awareness and involvement in patient safety initiatives (https://patientsafety.satx.disa.mil).

Given this history of emphasis and focus on patient safety in the Department of Defense, research that advances our understanding of issues related to patient safety in military treatment facilities directly contributes to the mission of improving patient care and helps in the development of the Congressionally-directed DoD Patient Safety Program.

GOAL

The overall goal of this research is to expand the patient safety research literature in ambulatory care by comparing and analyzing various dimensions of safety in select Air Force clinics as rated by four groups of healthcare professionals. Specifically the researcher will describe and compare various dimensions of patient safety in select Air Force ambulatory care facilities as rated by four groups of healthcare professionals. This comparison will allow for the development of strategies and interventions on the part of the local military treatment facility leadership to advance patient safety in those clinics. This research will also assist the Air Force leadership at the senior levels to develop similar intervention strategies.

SPECIFIC AIMS

The primary aim of this study is to determine if there are any differences among four groups of healthcare professionals (nurses, physicians, pharmacists, and technicians/Licensed Vocational Nurses) who work in select Air Force ambulatory care facilities on overall climate of safety, on six subscales of patient safety, and on collaboration and communication. A secondary aim is to determine if there are any significant differences among the four select Air Force clinics on measures of: overall safety climate, six subscales of safety climate, and collaboration and communication.

RESEARCH QUESTIONS

- What are the differences among four groups of healthcare professionals on overall safety climate, each of the six subscales of patient safety, and on collaboration and communication?

- What are the differences among four Air Force clinics on overall safety climate, each of the six subscales of patient safety, and on collaboration and communication?

HYPOTHESES

The following null hypotheses are posited for this research. Specifically,

H_0 There are no differences among four healthcare professional groups who work in select Air Force ambulatory care facilities on overall scores of patient safety climate as measured by the Safety Attitudes Questionnaire.

H_0 There are no differences among four healthcare professional groups who work in select Air Force ambulatory care facilities on any of the six subscales of patient safety as measured by the Safety Attitudes Questionnaire.

H_0 There are no differences among the four healthcare professional groups in their scoring of each other on the factors of collaboration and communication as measured by the Safety Attitudes Questionnaire.

H_0 There are no differences among four Air Force clinics on scores of overall patient safety climate, as measured by the Safety Attitudes Questionnaire.

H_0 There are no differences among four Air Force clinics on scores any of the six subscales of patient safety as measured by the Safety Attitudes Questionnaire.

H_0 There are no differences among four Air Force clinics on scores of communication and collaboration as measured by the Safety Attitudes

Questionnaire.

DESIGN

This study will be a nested design involving multi-site research at four designated, representative Air Force ambulatory-care facilities, targeting four major healthcare team groups---specifically physicians, nurses, technicians (also considered LVNs), and pharmacists who work at these facilities. The following four free-standing Air Force clinics in the central United States and all part of the Air Combat Command will be targeted for this multi-center study: Offutt Air Force Base, Nebraska; Ellsworth Air Force Base, South Dakota; Minot Air Force Base, North Dakota; and Whiteman Air Force Base, Missouri. These four facilities were chosen because they are similar in mission, size, and demographics of the staff.

SAMPLE AND SETTINGS

This nested design will describe four Air Force ambulatory-care facilities in the central part of the United States and located on bases that are part of the Air Combat Command. The demographics of each clinic will be described: the size of the clinic, the number and types of personnel, the budget, and the number of outpatient visits. The sample will be limited to nurses, physicians, pharmacists, and technicians (to include Licensed Vocational Nurses), both civilian and active duty. Middle-level providers such as nurse practitioners and physician assistants will be identified as sub-groups of nurses and physicians. The exclusion criteria will eliminate any operating room personnel who support a same-day surgery operation in an operating room and post-anesthesia recovery unit and the leadership staff of the facilities. The focus of this research is primary care, so the four categories of professional personnel will be those working in family

practice, internal medicine, and the outpatient specialty clinics (to include surgery, orthopedics, and ophthalmology).

DATA COLLECTION

The principal investigator (PI) will personally take leave and visit each research site between January 2007 and March 2007 to accomplish data collection. The principal investigator will dress in civilian clothes to minimize any focus on her rank as a senior officer. The data collection will not only include distributing and collecting the surveys but also collecting the demographic information regarding each clinic from the Resource Management Office. Personal contact on the part of the PI will reduce the likelihood of any perception of coercion or undue influence that could arise from a member of the leadership team at three of the clinics acting as liaison to distribute the surveys. This personal contact on the part of the PI will also reduce the overall research burden on the institution by communicating on e-mail or sending the completed surveys through the mail. The surveys will be distributed at meetings or other venues where the four professional groups are in attendance. A return envelope will be provided with each survey so the questionnaire may be enclosed after completion to protect the individual's confidentiality. Data collection at Offutt Air Force Base, where the principal investigator is assigned, will be coordinated with the help of the Chief of the Medical Staff and the Quality Coordinator, to avoid any appearance of coercion or benefit among that specific staff.

INSTRUMENT

The instrument for this research will be the Safety Attitudes Questionnaire (SAQ). The SAQ is in the public domain because it was developed at the University of Texas Center of Excellence

for Patient Safety, Research, and Practice by a grant from the Agency for Healthcare Research and Quality (Sexton, Helmreich, Neilands, Rowan, Vella, & Boyden, et al., 2006) http://www.uth.tmc.edu/schools/med/imed/patient_safety/index.htm).

The SAQ is a single-page, double-sided questionnaire with 60 items and demographic inquiries such as age, sex, experience, and nationality. The questionnaire takes 10-15 minutes, using a 5-point Likert scale with the following choices: disagree strongly, disagree slightly, neutral, agree slightly, and agree strongly. There is also an open-ended section with a question about recommendations for improving patient safety and a question about the quality of collaboration and communication experienced among the various types of providers in the clinical area, such as physicians, nurses, etc. (Sexton, et al., 2004). The authors of the SAQ concur with Colla, et al., (2005) that the terms safety climate and teamwork climate are preferable to the broader term of safety culture. Safety climate is preferable to the term safety culture when referring to the study of group-level perceptions using questionnaires because surveys measure perceptions. Concepts such as behavior, values, and competencies, often part of the definition of culture, cannot generally be captured by surveys (Sexton, Helmreich, Neilands, Rowan, Vella, & Boyden, et al., 2006).

The SAQ is the latest generation of a questionnaire that was developed 20 years ago in aviation, the Flight Management Attitudes Questionnaire (FMAQ), to measure a range of human factors as they relate to safety. Specifically the original FMAQ was created after researchers found that "airline accidents were due to breakdowns in interpersonal aspects of crew performance such as teamwork, speaking up, leadership, communication and collaborative decision making." (Sexton, et al, 2006). The FMAQ was later adapted to be the Intensive Care Unit Management Attitudes Questionnaire

The SAQ is a norm-referenced framework, as compared with criterion-based, developed from more than 10,000 responses from a range of healthcare providers in three different countries. The authors of the SAQ wanted to build on the experience of the airline industry, which has a history of assessing the attitudes of workers in order to better understand the environments in which flight safety is assessed and enhanced (Sexton, et al., 2004). To accomplish this goal, a cross-sectional survey of healthcare providers (n=10,843) was accomplished that targeted the work environments of critical care units, operating rooms, inpatient settings, and ambulatory clinics. The survey was administered in the United States, the United Kingdom, and New Zealand.

The overall response rate was 67% (10,832 out of 16, l84 questionnaires). The developers used factor analysis as a method of construct validity on this instrument, using 25 percent of the Flight Management Attitudes Questionnaire. Additional items in the SAQ were developed based on the subject covered and factor loadings, following discussions with subject matter experts. Both Vincent's framework for safety and Donabedian's model for evaluating quality were utilized (Seton, et al., 2006) In terms of factor analysis requirements, the total sample of more than 10,000 was more than adequate to develop the clusters of correlated items, or factors, and to be analyzed. For 62 items, that would mean less than 1000, so the SAQ exceeds the sample requirement.

Sexton, et al., (2004) reported using confirmatory factor analysis and advanced statistics to determine construct validity. Specifically they report the use of the standardized root mean residential (SRMR), the Comparative Fit Index (CFI), and the Root Mean Square Error of Approximation (RMSEA). The authors

reported analysis results of X^2 (784) = 10, 211.27, p < .001. (Sexton, technical report, 2001). The other values were also considered satisfactory. The 24 out of 38 items on the SAQ not loading under one of the six factors constitute 39% of the survey. Most of these items seem comparable to the six identified factors.

For reliability, the Cronbach alpha measuring internal consistency was reported as a range from .74 to .93 (Sexton, et al., 2001). Stability or equivalence reliability was not reported.

The developers of the SAQ point out that this instrument is different from other safety climate or culture surveys in four ways (Sexton, et al., 2006). First, the SAQ has been more widely used for a longer period of time. Second, a larger amount of psychometric data is available for the SAQ. Third, the SAQ was built on the FMAQ, a traditional human factors survey with a 20-year history in aviation. Finally, this continuity with other industries allows for comparisons between professions and helps identify human factor dimensions across professions (Sexton, et al., 2006). For purposes of this research, the SAQ answers the questions of concern to the primary investigator, specifically questions related to collaboration and communication and those posed by the six subscales.

Another instrument that could have been used for this research is the Department of Defense Triservice Patient Safety Survey, developed and administered through the Military Health Service in late 2005 and early 2006 as a web-based tool (TRICARE Management Activity, 2006). The overall response rate was 53%, and the ambulatory care response rate was only 7%. This tool is not appropriate for this research because it does not have the history of use and

publication in the literature, and it does not address all the questions of interest to the investigator.

STATISTICAL ANALYSIS

The statistical analysis of this proposed research will be two multivariate analyses of variance (MANOVAs). The independent variable of the first MANOVA will be one group with four levels: physicians, nurses, pharmacists, and technicians. The eight dependent variables are self-reported data: 1) scores on safety climate, 2) scores on six subscales of safety, and 3) scores on collaboration and communication. The independent variables of the second MANOVA will be Air Force clinics with four levels: Offutt Air Force Base, Minot Air Force Base, Ellsworth Air Force Base, and Whiteman Air Force Base. The dependent variables, self-reported data, for the second MANOVA are the same as those of the first: 1) scores on safety climate, 2) scores on six subscales of safety, and 3) scores on collaboration and communication.

The data will drive additional analysis and drilling into the findings as indicated. For example, secondary analyses will examine where there are differences among the separate groups and among the four clinics on each of the subscales and if issues such as gender or age are confounding factors. Additional analysis will include those survey questions that are not loaded in the subscales to determine their relevance and if any of them are predictive of the overall scores. This research will also include an analysis of internal consistency reliability, or Cronbach's alpha.

A power analysis was computed to ensure sufficient sample size. A moderate effect size is assumed based on the research using the SAQ by Thomas, et al.(2003). For four groups, estimating a moderate effect size of .05, and a power of .8, two-tailed, a =.05, the sample size

required is 53 subjects per group (Polit, 1996, p. 483). This sample size was determined to be sufficient to support a strong study (Dr. Dorraine Watts, e-mail communication, 6 July 2006).

Following approval of this proposal by the dissertation committee, the researcher will submit a request for approval to conduct the study from the Air Force Survey Office at Randolph Air Force Base, Texas. Such approval is required in accordance with Air Force Instruction 36-2601. The Air Force Survey Office will issue a Survey Control Approval Letter. Following receipt of this approval letter, the researcher will solicit and receive letters of support to conduct the study from the commanders of the four clinics designated as research sites.

After receiving approval from the Air Force Survey Office and letters of support from the four medical group or clinic commanders, the researcher will then request Institutional Review Board (IRB) approval from the Uniformed Services University of the Health Sciences and Wilford Hall Medical Center in San Antonio, Texas. Wilford Hall is the IRB of jurisdiction for the four selected clinics. There are no separate IRBs at these individual bases. The researcher will request exempt status since the research is a survey instrument and does not put any human subjects at risk. The survey is anonymous except for demographic data regarding position, age, and gender. The results of the research will be shared with the Air Force Patient Safety Program director, Lieutenant Colonel Kathryn Robinson at Bolling Air Force Base, Washington D.C., and also the staff of the four clinics involved with the research. Findings of the research and the subsequent analysis will be submitted for publication to the Journal of Quality and Safety in Healthcare.

TIMELINE

Oct 2006	Defend proposal at USUHS
Dec 2006—Feb 07	Approval from AF Survey Office, Institutional Review Boards at USU, Air Force Wilford Hall, TX
Feb—Apr 07	Data collection at the four identified clinics
May 07	Complete analysis.
Aug 07	Defend dissertation at USUHS

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UNIFORMED SERVICES UNIVERSITY FOR THE HEALTH SCIENCES GRADUATE SCHOOL OF NURSING

COLONEL LELA M. HOLDEN
USAF, NC, MA, MSN

13 OCTOBER 2006

Title

- AN ANALYSIS OF DIMENSIONS OF PATIENT SAFETY IN AMBULATORY-CARE FACILITIES

Dissertation Committee

- PATRICIA HINTON WALKER, PhD, CHAIR,
- DR DORRAINE WATTS, PhD
- DR ROBERT BIENVENU II, PhD

Background
Seminal Studies & Publication

- **Harvard Medical Practice Study---1991**
  - **3.7% patients admitted to non-psychiatric New York hospitals in 1984 experienced adverse event**
- ***To Err is Human,* 2000, IOM REPORT**
  - **Based on compilation of studies**
    - **Between 48,000 and 98,000 patients die every year as a result of medical error**

Background

- IOM report and its impact in the popular press and in Congress galvanized a patient safety movement
- $50m research through AHRQ
- Instrument proposed came from this $$

Background
Significance

Most care in US not in hospitals:

On any one day, 25% Americans visit a physician's office, compared to 8% who are hospitalized; 1% hospitalized in academic centers

Extensive research on errors primarily in academic hospitals

(Green, et al., 2001)

Background
Significance

75% of all medical procedures now performed in ambulatory settings (Phillips, et al., 1998)

Rate of adverse events: 3.7 per 100,000 clinic visits from risk-management database, over 5-year period (Fisher, et al., 1997)

Background Significance
Rationale for ambulatory care

Challenges in ambulatory care:

Early discharge from hospital
Potentially dangerous drugs
Pressure of short consultations
Increasingly fragmented nature of services

Wilson, et al. (2001, p.583)

Background Significance Rationale for Ambulatory Care

Research predominantly taxonomy development

What goes wrong?

3 categories of preventable adverse events:

- diagnosis
- treatment
- preventive services

Elder & Dovey (2002)

Background Significance Rationale for Ambulatory Care

Why does something go wrong?

Process Errors

- Clinician Factors
- Communication factors
- Administration factors
- Blunt-end factors (management)

Elder & Dovey (2002)

Military Relevance of this Research

2001 National Defense Authorization Act

Department of Defense Patient Safety Program

- mandated centralized process for reporting, compiling, and analyzing medical errors in DoD

Military Relevance of this Research

DoD Patient Safety Program components:

- TRICARE Management Activity
  Chief Medical Officer
- Patient Safety Center—data repository
- Center for Education & Research in Patient Safety (CERPS)---USUHS
- Healthcare Team Coordination Program

Military Relevance of this Research

Consistent with the objectives of DoD Patient Safety Program which are:

- **Improve coordination of patient safety activities across services**
- **Develop an analysis plan to uncover opportunities for improvement in the military health system**
- **Create a culture of trust in reporting medical errors**

Study Goal

Expand the patient safety research literature in ambulatory care by comparing and analyzing various dimensions of safety in select Air Force clinics as rated by four groups of healthcare professionals.

Specific Aims

Conduct analysis to determine if there are differences among nurses, physicians, pharmacists, and technicians working in Air Force ambulatory care facilities on six subscales of patient safety, collaboration and communication, and overall climate of safety scores

Specific Aims

Six subscales of patient safety:

- Teamwork Climate
- Safety Climate
- Perceptions of management
- Working conditions
- Job satisfaction
- Stress recognition

Research Questions

What are the differences among four Air Force clinics on overall safety climate, six subscales of patient safety, and on overall scores of collaboration and communication?

What are the differences among four groups of healthcare professionals on overall safety climate, six subscales of patient safety, and on overall scores of collaboration and communication?

Hypotheses

Null:

No differences among these four Air Force clinics on these three measures

No differences among these four groups of healthcare professionals on these three measures

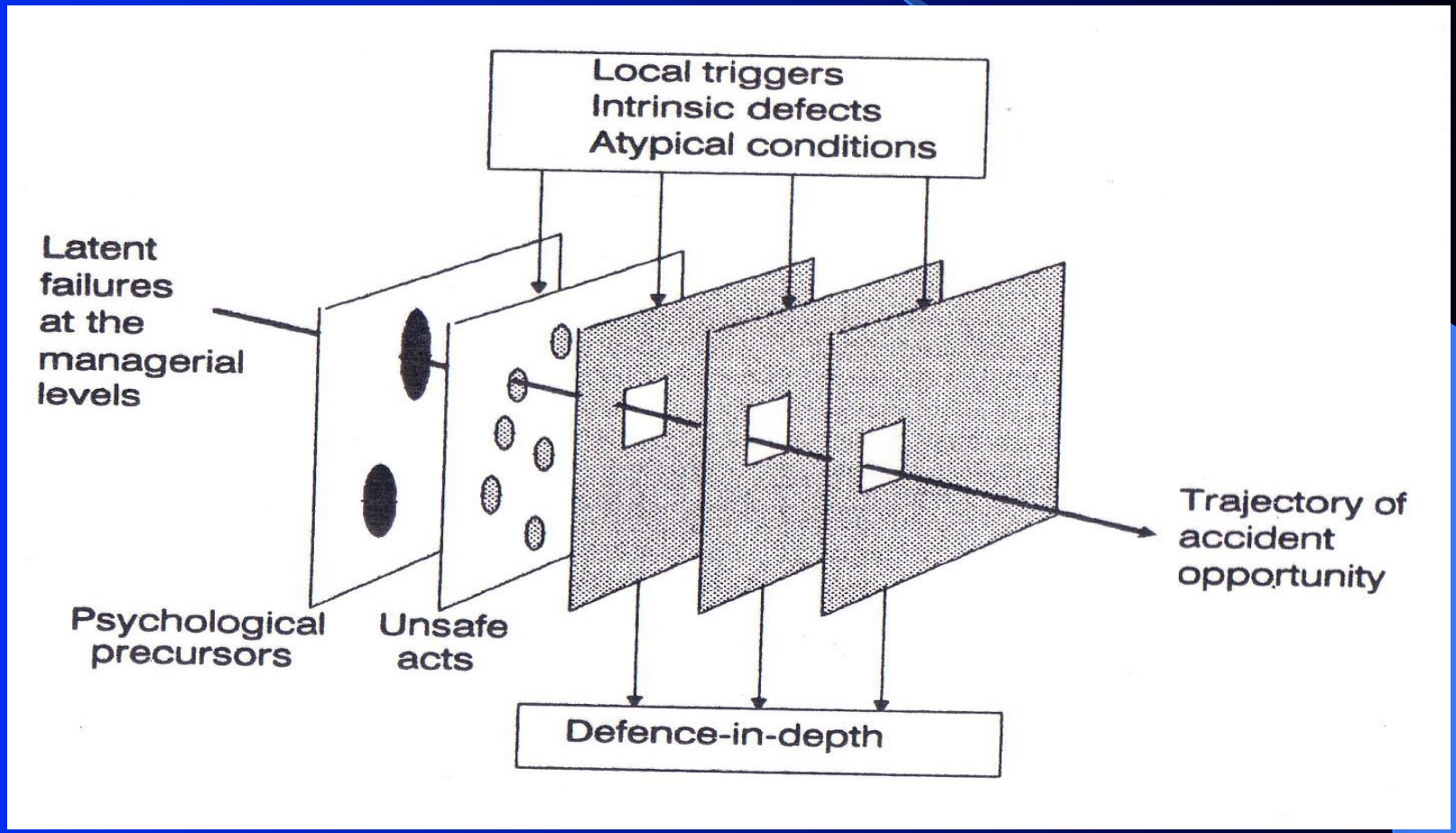
Conceptual Models: Background

A NUMBER OF APPROACHES

- James Reason---Most recognized
- Active Errors (sharp end) immediate effects
- Latent errors (blunt end)---lie dormant long time

Not unlike resident pathogens in the body become activated and toxic given local triggers

Conceptual Model: Background
James Reason, 1990

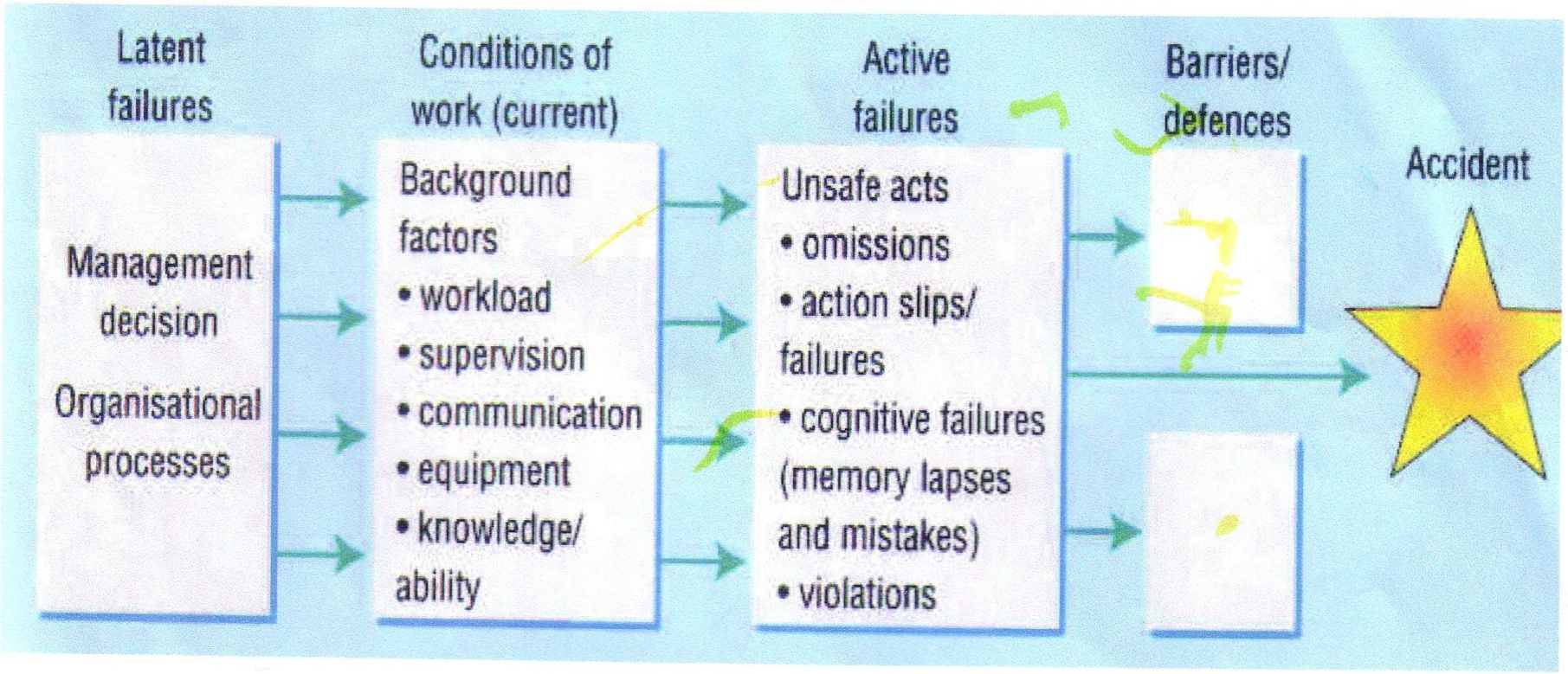


Conceptual Model for this Study

Psychologist Charles Vincent applied this model to healthcare and added contributory factors:

Latent Failures—Management Decisions
Conditions of Work—Workload, training
Active Failures—Omissions, mistakes
Contributory Factors—Team factors
communication
patient factors

Conceptual Model
Charles Vincent, 1998



Design Instrument: Safety Attitudes Questionnaire

Why?

- Best instrument to answer research questions
- Utilized since 2001, well published
- Developed at the University of Texas Center of Excellence for Patient Safety, Research and Practice
- AHRQ grant—2001 #1PO1HS1154401

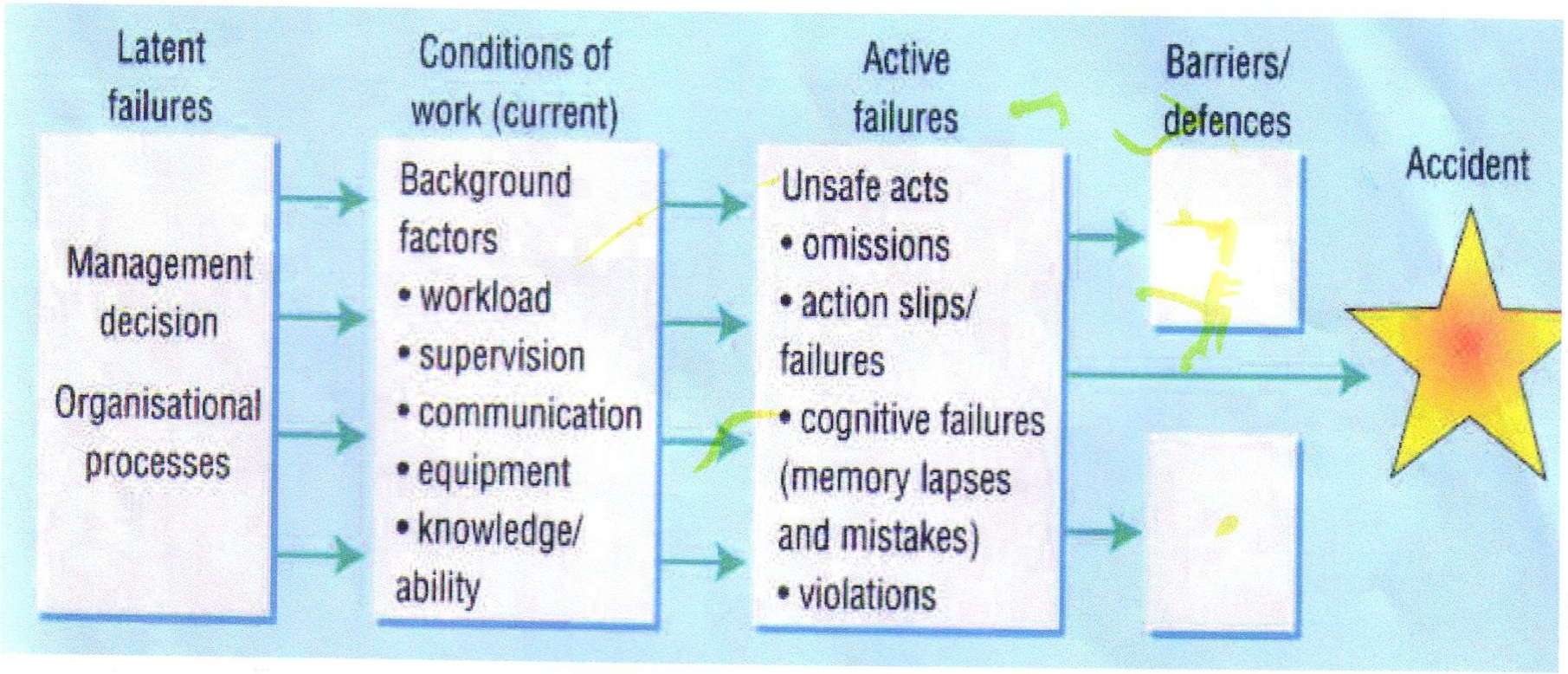
Instrument Conceptual Model

Vincent	SAQ Subscales & Items
Conditions of Work & Contributory Factors	Teamwork Climate (6)
Latent Failure & Contributory Factors	Safety Climate (7)
Latent Failure Contributory Factors	Perception of Management (5)

Instrument Conceptual Model

Vincent	SAQ Subscales & Items
Conditions of Work & Contributory Factors	Job Satisfaction (5)
Conditions of Work & Contributory Factors	Working Conditions (9)
Active Failure Contributory Factors	Stress Recognition (6)

Conceptual Model
Charles Vincent, 1998



Design Instrument Development of SAQ

- Norm-referenced tool, 3rd generation of tool used in aviation for 20 years
- Content, face validity:
  - focus groups of healthcare providers
  - round-table discussions with subject-matter experts
- 100 items developed---exploratory factor analysis

Sexton, et al. SAQ Norms & Psychometric Properties, Technical Report 04-01. AHRQ Grant #1PO1HS1154401

Design Instrument Psychometrics of SAQ

- Confirmatory factor analysis, advanced
- statistics to determine construct validity

  Factor loadings from 10,843 providers
  203 clinical areas, US, UK, New Zealand

- Internal consistency reliability,
  Cronbach's Alpha, ranged from .74 to .93

Sexton, et al. SAQ Norms & Psychometric Properties, Technical Report 04-01. AHRQ Grant #1PO1HS1154401

Design Instrument Psychometrics of SAQ

- Good sensitivity: 5-point Likert Scale
- Appropriate reading level
- 38 out of 62 items loaded on one of six factors
  24 additional items (39%) not loaded
- Continues to be work in progress

Sexton, et al. SAQ Norms & Psychometric Properties, Technical Report 04-01. AHRQ Grant #1PO1HS1154401

Design Instrument Rationale for SAQ

Why? Complex tool superior to DoD, other tools

- Measures communication & collaboration among different groups
- Six subscales with dimensions of safety
- Qualitative section—asks for recommendations for improvement

DoD Instrument

Triservice Patient Safety Survey—2005/06

- **Developed by Westat for all services**
  - **web-based**
  - **164 facilities/140,000 staff**
- **Overall Response rate 53%**
- **Ambulatory care response rate only 7%**

Design Setting

Nested design involving multi-sites four free-standing Air Force ambulatory care facilities in the central US, all part of Air Combat Command:

1. Offutt Air Force Base, NE
2. Grand Forks Air Force Base, SD
3. Minot Air Force Base, ND
4. Whiteman Air Force Base, MO

Design Subjects

Four groups of healthcare professionals working in these clinics

1. Nurses
2. Pharmacists
3. Physicians
4. Technicians (includes LVNs)

Design Power Analysis

To determine sample size:

A moderate effect size is assumed based on research using SAQ (Thomas, 2003)

Power of .8, two-tailed, *a*=.05, will need a sample size of 53 per group, or a total of 250 (over-sample)

Design Data Analysis

MANOVA using one group with four levels:
MDs, RNs, Pharmacists, Technicians

Self-Reported Data
DV: scores on collaboration and communication
DV: overall score on safety climate
DV: scores on six separate subscales

Additional analysis and drilling into comparisons as indicated by initial findings

Design Data Analysis

MANOVA using one group of clinics
with four levels:
Offutt, Minot, Grand Forks, and Whiteman

Self-Reported Data
DV: scores on collaboration and communication
DV: overall score on safety climate
DV: scores on six separate subscales

Additional analysis and drilling into comparisons
as indicated by initial findings

Design Data Collection

Researcher will travel to each site while on leave to distribute and retrieve questionnaires, to eliminate perceived coercion by clinic executive team

Envelope will be provided with each survey to maintain confidentiality, mitigate any perception of coercion

Proposed Timeline

Oct 06	USU Proposal Defense
Nov 06—Feb 07	Approval from IRBs: USU, AF Wilford Hall TX AF Survey Office—TX
Mar—May 07	Data Collection
Jun—Jul 07	Data Analysis
Aug 07	Defend Dissertation

AIR FORCE

CROSS INTO THE BLUE

Questions?

UNIFORMED SERVICES UNIVERSITY OF THE HEALTH SCIENCES
4301 JONES BRIDGE ROAD
BETHESDA, MARYLAND 20814-4712
www.usuhs.mil

March 27, 2007

MEMORANDUM FOR COL LELA HOLDEN, MSN, GRADUATE SCHOOL OF NURSING

SUBJECT: Uniformed Services University Institutional Review Board Approval (DoD Assurance No. P60001 and FWA # 00001628) of Amendment to T061H0

The amendment to your protocol T061H0 entitled, "*An Analysis of Dimensions of Patient Safety in Ambulatory-Care Facilities,*" was reviewed and approved for execution on March 27, 2007 by Edmund G. Howe, M.D., J.D., Chairperson, Institutional Review Board, under the provisions of 32 CFR 219.110(b)(2). This approval will be reported to the full Uniformed Services University IRB scheduled to meet on April 12, 2007.

The primary aim of this study is to determine if there are any differences among four groups of healthcare professionals (nurses, physicians, pharmacists, and technicians/licensed vocational nurses) who work in select Air Force ambulatory care facilities on overall climate of safety, on six subscales of patient safety, and on collaboration and communication. A secondary aim is to determine if there are any significant differences among the four select Air Force clinics on measures of overall safey climate, six subscales of safety climate, and collaboration and communication.

This action approves amendment one. The categories of healthcare providers listed in the questionnaire will be changed to reflect Air Force terminology. For example, office managers will be called GPMs (Group Practice Mangers).

You are required to submit amendments to this protocol, changes to the informed consent document (if applicable), adverse event reports, and other information pertinent to human research for this project to this office for review. No changes to this protocol may be implemented prior to IRB approval. If you have questions regarding specific issues on your protocol, or questions of a more general nature concerning human participation in research, please contact me at 301-295-0814 or lgiberman@usuhs.mil.

Laura Giberman
Laura Giberman
Institutional Review Board Coordinator

cc: REA
Chair, GSN
File

59th Medical Wing (Wilford Hall Medical Center)
Institutional Review Board (IRB)
59th Clinical Research Division
Protocol Support/MSRP/(210) 292-7143
2200 Bergquist Dr, Bldg 4430, Lackland AFB, TX 78236-5300
Federal Wide Assurance #FWA00001750 and DoD Assurance #50007

FINAL EXEMPT PROTOCOL APPROVAL **19 Mar 07**

Expedited Approval Date: 14 Mar 07

Principal Investigator: Col Lela Holden/SGN

Protocol Reference Number: FWH20070124E

Protocol Title: "An Analysis of Dimensions of Patient Safety in Ambulatory-Care Facilities"

1. Your AFI 40-402 EXEMPT PROPOSAL received expedited review on behalf of the WHMC Institutional Review Board by the IRB Chair or his designee on *14 Mar 07*. Your study was approved as written and may now begin.

2. The IRB Chair or his designee must be notified immediately of any additional information, or changes to the protocol. All amendments to the protocol must be reviewed and approved by the MSR Commander prior to their inception.

3. It is the IRB Chair or his designee's decision that this study will be terminated as of 13 Mar 08 unless you submit a status report, using the template provided on your research disk. Your first status report, which is a request for continuation of the study, will be due to the Protocol Office no later than 1 Feb 08. A status report will be due every 11 months thereafter, in order for the MSR Commander to approve continuance of the study for another year. Upon completion of your study you must submit a final report.

4. If funds were requested for your study, you will be notified by CRES Resource Manager (ext. 2-7295) as to the status of requested funds. **YOU ARE NOT AUTHORIZED TO USE YOUR SECTION'S O&M FUNDS.**

Maria Dominguez
Protocol Assistant

File this and any other IRB correspondence in your study binder

Uniformed Services University of the Health Sciences
Graduate School of Nursing
Request for Appointment of Dissertation Chairperson (Form C)

Name of Student: COLONEL LELA M.HOLDEN

Semester: FALL 2006 Area of Concentration PATIENT SAFETY

Name of Selected Dissertation Chairperson:
DR PATRICIA HINTON WALKERWALKER

Phone Number: 301-295-9004

The above named student has selected the named faculty member to serve as Dissertation Chairperson.

The undersigned faculty member agrees to serve as the Dissertation Chairperson, understanding all responsibilities that are part of this critical role:

PATRICIA HINTON WALKER
Printed Name

Signature

LELA M.HOLDEN
Printed Name of Student

Signature

(Approval)/Disapproval

Signature: Karen Elberson Date: 13 October 2006
Karen Elberson, RN, PhD
Director, Doctoral Program

(Approval)/Disapproval

Signature: Date: 10/16/06
William T. Bester, RN, MSN, CNAA, BC
Brigadier General (Ret)
Acting Dean, Graduate School of Nursing, USUHS

Uniformed Services University of the Health Sciences
Graduate School of Nursing
Request for Appointment of Dissertation Advisory Committee (Form D)

Name of Student: COLONEL LELA M. HOLDEN

Semester: FALL 2006 Area of Concentration PATIENT SAFETY

Dissertation Chairperson: DR PATRICIA HINTON WALKER

Selected Faculty to Serve as Dissertation Advisory Committee:

1. DR DORRAINE WATTS Phone # 301-295-1009
2. DR ROBERT BIENVENEU Phone # 301-260-7881

The above named student has selected the named faculty members to serve as the Dissertation Advisory Committee.

The undersigned faculty members agrees to serve as the Dissertation Advisory Committee, understanding all responsibilities that are part of this critical role:

DORRAINE D.WATTS
Printed Name of Faculty Member

Signature

ROBERT V. BIENVENEU II
Printed Name of Faculty Member

Signature

LELA M. HOLDEN
Printed Name of Student

Signature

Approval/Disapproval

Signature: Karen Elberson Date: 13 October 2006
Karen Elberson, RN, PhD
Director, Doctoral Program

Approval/Disapproval

Signature: Date: 10/16/06
William T. Bester, RN, MSN, CNAA, BC
Brigadier General (Ret)
Acting Dean, Graduate School of Nursing, USUHS

Uniformed Services University of the Health Sciences
Graduate School of Nursing
Report of Proposal Defense Examination
for the Doctor of Philosophy Degree (Form E)

The proposal defense of COLONEL LELA M. HOLDEN
entitled: AN ANALYSIS OF DIMENSIONS OF PATIENT SAFETY IN AMBULATORY-CARE FACILITIES was held

on 13 October 2006 from 1300 to 1430. The decision of the Examining Committee is:

PASS
A. Both the proposal and the oral explanation are satisfactory: X

B. Minor changes are recommended by the Dissertation Advisory Committee and are to be made to the satisfaction of the Dissertation Chairperson: X on written proposal.

DEFER
A. Minor changes in the proposal are required. Changes must be made to the satisfaction of the Dissertation Chairperson: _____

B. Major changes are required. Changes must be made to the satisfaction of the Dissertation Advisory Committee: _____

C. Remediation required prior to making major changes. Completion of remediation must meet the satisfaction of the Dissertation Advisory Committee: _____

FAIL
Neither the oral performance nor the proposal is adequate: _____

Signatures of the Committee

Chairperson: _____

Member: _____

Member: _____

(Approval)/Disapproval

Signature: Karen Elberson Date: 13 October 2006
Karen Elberson, RN, PhD
Director, Doctoral Program

(Approval)/Disapproval

Signature: _____ Date: 10/16/06
William T. Bester, RN, MSN, CNAA, BC
USUHS Brigadier General (Ret)
Acting Dean, Graduate School of Nursing,

Uniformed Services University of the Health Sciences
Graduate School of Nursing

Request to Change a Member of the Dissertation Advisory Committee (Form K)

Lela M. Holden _____

Name of Student Signature Date

Title of the Dissertation: An Analysis of Several Dimensions of Patient Safety In Ambulatory-Care Facilities

Reason for the Change: Dr. Beinvenue resigned his faculty position, and is no longer with the Uniformed University of the Health Sciences

Signatures of the Dissertation Advisory Committee acknowledging they are aware of the proposed change:

_____ 4/1/08
Signature, Chairperson, Date
Patricia Hinton Walker, PhD, RN, FAAN

Faculty Member Has Resigned – No Signature N/A
Signature, Outgoing Committee Member Date
Dr. Robert Bienvenue, PhD

Dr. Christine Kasper _____ 4/1/08
Signature, Incoming Committee Member Date
Christine Kasper, PhD, RN, FAAN (CV Attached)

_____ 4/7/08
Signature, Committee Member Date
Dorraine Watts, PhD, RN

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Title/Author Biography Page

TITLE: Swatting Mosquitoes or Draining the Swamp?

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The colorful images and metaphors often used in the patient safety literature are vivid: "Swiss cheese" that shows random holes through which errors line up and penetrate; "resident pathogens" in the organization that lurk as they do in the body ready to capitalize on a trigger to activate an error; and the "mosquito" of individual error that can be swatted as compared to the swamp of conditions that should be drained from an organization. These images come from the penetrating analysis and brilliant writing of British psychologist, James Reason (1,2).

British psychologist James Reason's work on latent and active errors was given great visibility in the groundbreaking report by the Institute of Medicine, *To Err is Human* (3). Earlier work by a giant in the field of patient safety, Lucian Leape, also drew on Reason to describe such latent problems as poor work schedules or faulty training as part of a focus on system errors that result in patient harm (4). In addition Reason's work provides the conceptual underpinnings for the 2006 edition of the *Annual Review of Nursing Research, Focus on Patient Safety* (5). Although latent and active errors are the most popular concepts utilized by others, Reason's work offers a number of additional potent insights---ideas with which nursing leaders should be conversant. And his ideas provoke questions which every nursing leader in a healthcare facility committed to safety should be asking. This paper reviews those ideas and raises the obvious questions that such insights provoke.

Does the organization look for latent errors?

Reason's early work examined the accidents at Three Mile Island, Bhopal, Chernobyl, and the Challenger explosion. In reviewing the details of those disasters he emphasized that active operator errors and equipment failures should not be the main focus of analyses and investigations. Rather many root causes, or latent errors, were present within the system long before the operator and equipment failures, or active errors were committed:

> " Rather than being the main instigators of an accident, operators tend to be the inheritors of system defects created by poor design, incorrect installation, faulty maintenance and bad management decisions. Their part is usually that of adding the final garnish to a lethal brew whose ingredients have already

been long in the cooking..”(1, p.173)

Examples of these latent errors jump out as obvious if one is looking for such processes. For example, in describing the release of small quantities of radioactive material in the atmosphere during a 16-hour emergency at the nuclear power plant at Three Mile Island on 28 March 1979, Reason notes the following:

> A retrospective review of licensee event reports revealed repeated omissions, inadequate failure analyses and lack of corrective actions . . . pipes and valves lacked suitable means of identification. Thus 8 hours after the start of the accident, operators spent 10 minutes typing unsuccessfully to locate three decay heat valves in a high radiation field. (1, p.191-192)

Similarly, Reason explains that the explosion of the Space Shuttle Challenger on 28 January 1986 was the result of the splitting of a rubbery seal, called an O-ring, on one of the solid rocket boosters after lift-off, releasing a jet of ignited fuel that caused the entire rocket complex to explode. This problem had been identified 9 years before, and the repeated erosion and faults is a “complicated tale of incompetence, selective blindness, conflicting goals and reversed logic” (1, p.191-192). The inescapable conclusion from an analysis of these and other disasters is that there is rarely ever one causal factor, either mechanical or human. Rather, disasters “arise from the unforeseen and usually unforeseeable concatenation of several diverse events, each one necessary but singly insufficient” (1, p.197).

The manner in which these diverse events concatenate is visually laid out in one of Reason’s models as noted below. Later evolutions of this diagram would become known as the “cheese model. ” Specifically, the various holes in the plates, and later the cheese, can be described as fallible decisions, line management deficiencies, and psychological precursors, all of which are considered latent failures. These latent failures are fallible decisions taken by top-level plan and corporate managers. These are subsequently followed by unsafe acts (active failures), and then finally inadequate defenses. These latter two events, unsafe acts and inadequate defenses, then align with local triggering events and/or atypical conditions to create accidents. See model below:

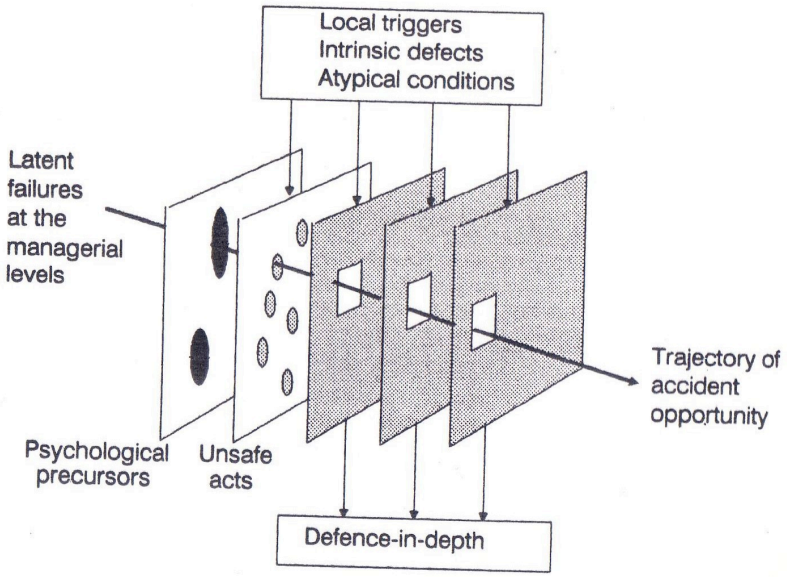

Figure 1 How Accidents Happen

"The diagram shows a trajectory of accident opportunity penetrating several defensive systems. This results from a complex interaction between latent failures and a variety of local triggering events. It is clear from this figure, however, that the chances of such a trajectory of opportunity finding loopholes in all of the defenses at any one time is very small indeed" (1, p.208).

For a nursing leader the latent conditions could be considered chronic understaffing and look-alike medication vials, producing rushed staff who fail to check closely the similar vials on a medication cart. A syringe of regular insulin is drawn up and infused into a IV instead of the normal saline flush the nurse thought she was drawing up. The patient goes into hypoglycemic state and arrests.

What and where are the resident pathogens in the organization?

Not all unsafe acts or even line management deficiencies are the result of fallible decisions. Here Reason introduces a powerful and medically appropriate analogy that has been extensively quoted by others. Reason notes that latent failures in complex technological systems are similar to resident pathogens in the human body. These resident pathogens in the human body are tolerated, detected, and kept in check by protective measures, mainly the immune system. This analogy also suggests that the likelihood of an accident will be a function of the number of pathogens residing in the system. The more pathogens, the

more likely "it will encounter just that particular combination of triggering conditions sufficient to complete an accident sequence" (1, p.198).

The occasional local triggers that arise in the human body, such as excessive stress or fatigue, combine with the resident pathogens in subtle and unlikely ways to thwart the body's defenses and to produce illness. Likewise, the "pathogens" related to unsafe acts can also be those in the human condition: being stressed, unaware, unmotivated, and failing to perceive hazards. Again, even the best organizations cannot eliminate these precursors to unsafe acts, but they can provide adequate defenses to mitigate their effects. Pathogens can be introduced by any strategic decision, according to Reason, even if the decision was not a bad one. The latent conditions produced have two kinds of adverse effect:

> they can translate into error provoking conditions within the workplace (for example, time pressure, understaffing, inadequate equipment, fatigue, and inexperience) and they can create long-lasting holes or weaknesses in the defenses (untrustworthy alarms and indicators, unworkable procedures, design and construction deficiencies, etc.) . . . unlike active failures, whose specific forms are often hard to foresee, latent conditions can be identified and remedied before an adverse event occurs. Understanding this leads to proactive rather than reactive risk management (6).

The nursing leader attempting to identify resident pathogens would do well to employ a keen eye for complexity and variability where simplicity and standardization should be visible. For example, how many intravenous pumps are used in the medical facility? The greater the number, with varying instructions and set-up methods, the more likely an error will occur. Any medical institution that has a range and variety of a specific category of critical equipment is clearly nurturing a resident pathogen; it's only a matter of time before such variability will produce a error.

What type of response characterizes your organization? Denial? Repair? Reform?

So, a major error occurs---a patient dies as a consequence of an avoidable adverse event. Liquid Tylenol is injected into an intravenous line rather than a nasogastric feeding tube, for example. How does the organization respond? Reason describes organizational responses as denial, repair, or reform. Denial

is characterized by suppression, in which the observers are punished or fired, and the observations removed from the records through actions such as encapsulation, a condition in which the observers are retained, but their observations are disputed or denied. Repair actions include a component called public relations because the observations become public, but their significance is minimized or denied. With a repair response the organization will admit there is a problem, but only a local one, and the implications for the wider system are denied. Reason specifies that reform actions involve dissemination, in which case the problem is admitted to be global, and wide-spread action is taken in response. Furthermore, with reform actions, reorganization occurs, and action on the problem leads to review and reform of the operational system (1, p.211). Obviously a reform approach is the most desirable.

Does the organization look for someone to blame? Is the substitution test used?

Other major concepts characterize Reason's comprehensive approach to human error. The first is his reference to the social psychology term of *fundamental attribution error* (italics in the original) that refers to a "pervasive tendency to blame bad outcomes on an actor's personal inadequacies (i.e. dispositional factors) rather than attribute them to situational factors beyond his or her control (2, p.208). For example, in the case of the Three Mile Island nuclear power plant emission of radiation, many writers blamed the operators, but the fact is that proper instruments were not available to assist in diagnosing the problem, nor did the pressure relief valves close as they should have. Indeed, equipment failure plus serious design error could rightfully be considered as much at fault as the operators involved.

The substitution test, a concept developed by Neil Johnston, involves the mental test of substituting a person with similar qualifications and experience. For example, Nurse Smith makes an error. The nurse leader should ask the following question: "In the light of how events unfolded and were perceived by those involved in real time, is it likely that Nurse Jones would have behaved any differently?" (2, p.208). Or the leader should ask a number of peers of the nurse involved: "given the circumstances that prevailed at that time, could you be sure that you would not have committed the same or similar type of unsafe act?" If the answer is "probably not," then assigning blame is not appropriate (2, p.208).

How to determine blame?

There are other specific questions the nurse leader can ask when determining blame. Reason lays the algorithm out clearly (2, p.209). The first has to do with intention. Were the actions as intended? Were the consequences as intended? If the answer is yes, then sabotage and blame should be assessed. If neither the actions nor the consequences were intended, then the nurse leader asks whether the individual knowingly violated safe, workable, and correct procedures? If the answer is no, then the inference follows that the system failed in establishing procedures that are correct and useful. At this point the substitution test can be used. Using these procedures would another nurse have made the same error? If the answer is yes, then again the leader must examine how procedures and systems are structured and asses that the a system-induced error occurred. If another individual would not have made the error, then deficiencies in training, selection, and experience must be assessed. The final question relates to a history of unsafe acts. If that answer is also no, then the error should be considered blameless. Again, Reason lays out an approach to error that is illuminating and helpful.

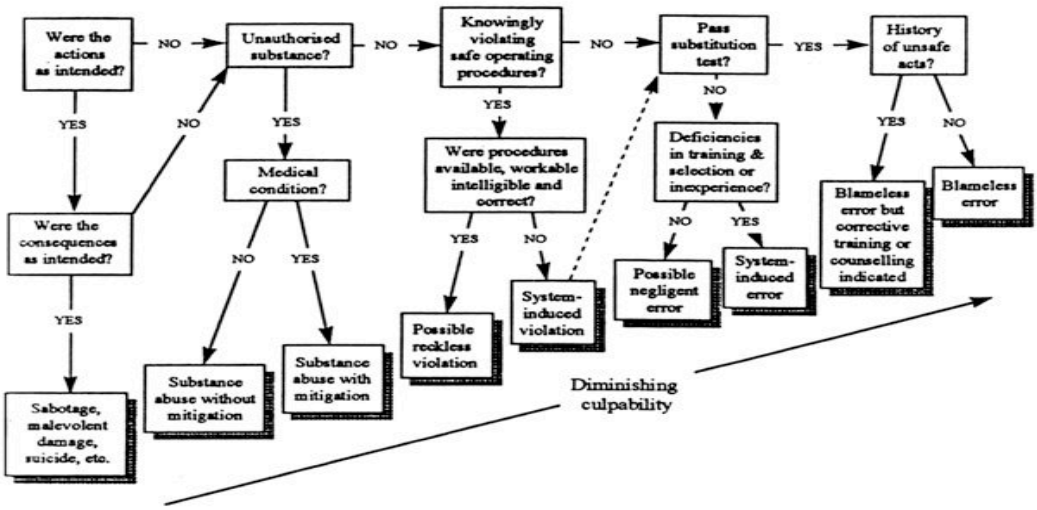

Figure 2 Decision Tree for Determining Blame

Reason 1997 (14)

Does the organization suffer from hindsight bias?

Another major concept that Reason explicates toward the end of his 1990 book is the notion of *hindsight bias* (italics in the original). Again he draws on psychologists from the 1970s and 1980s who explain that being blessed with both uninvolvement and hindsight produces the perception that the people involved in the incident were stupid, arrogant, ignorant, or reckless. These judgmental attitudes are produced by the perceptual distortions which come from a retrospective analysis and the advantage of knowing how the event turned out. This outcome knowledge strongly influences perceptions, yet in an unconscious manner. Such perceptions are described as the "knew-it-all-along" effect (1, p.212-215). Those involved with the incident at the time of the occurrence did not have the benefit of knowing how the event concluded, and it is often extremely difficult for those involved at the time to foresee disastrous outcomes from what seemed at the time to be unconnected and generally usual events. Reason warns all those looking at accidents to make a clear distinction between the way the elements of a disaster appear given knowledge of the terrible outcome, and the way they seemed at the time. He goes on to summarize these poignant warnings:

> Before we rush to judgment, there are some important points to be kept in mind. First, most of the people involved in serious accidents are neither stupid nor reckless, though they may well have been blind to the consequences of their actions. Second, we must beware of falling prey to the fundamental attribution error (i.e. blaming people and ignoring situational factors). . . . complex tightly-coupled systems will suffer unforeseeable sociotechnical breakdowns. Third, before beholding the mote in his brother's eye, the retrospective observer should be aware of the beam of hindsight bias in his own. (1, p.216)

Does the organization show evidence of constant vigilance and chronic unease?

Finally Reasons states that all human endeavors contain some risk because no one can anticipate or predict all the possible accident scenarios; therefore fail-proof systems are impossible. Once again, Reason creates a phrase that eloquently expresses both the dilemma and the challenge of safety and human error:

"Maintaining safety within acceptable limits requires constant vigilance and chronic unease, both difficult to sustain when there are always many other demands upon limited human and financial resources" (7).

Conclusion

James Reason has provided an invaluable framework for nursing leaders to assess errors and evaluate the culture of safety in their institutions. From looking for latent and active errors, or finding those resident pathogens that exist in every organization, to posing the substitution test or looking vigorously for hindsight bias, leaders must ask many tough questions and courageously seek often elusive answers. James Reason's work influenced industry and healthcare and stimulated the development of other models, such as the one developed by Charles Vincent. But these poignant questions, insightful models, and colorful metaphors have laid a deep foundation and exerted a lasting influence. However, ideas are only as good as the organizational leader who uses them. One must ask every day in healthcare: Are we swatting mosquitoes or draining the swamp? (6, p.768-769).

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TITLE PAGE

Title:
Communication and Collaboration: Climate of Patient Safety in Ambulatory Care

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ABSTRACT:

Objective: Collaboration and communication as dimensions of patient safety climate have been measured in acute care hospital units, and discrepant viewpoints have been documented between different professional groups. In the ambulatory care setting, different healthcare professionals often work more closely together throughout the day than in acute care settings, thereby enhancing effective collaboration and communication. This study sought to determine if the communication differences that are known to impact patient safety which are found in acute care also exist in ambulatory care.

Methods: The Safety Attitudes Questionnaire (SAQ), a 77-item survey of collaboration, communication, and safety attitudes was administered to the primary care staff at four Midwestern military ambulatory care clinics.

Results: There were 107 participants consisting of nurses (n=46), nurse practitioners (n=12), pharmacists (n=10), and physicians (n=39), yielding an overall response rate of 65%.
All groups rated their peer group higher than other professional groups. The ratings of nurses and physicians were very similar: 85.0% of nurses rated physicians, and 85.7% of physicians rated nurses as high or very high in communication and collaboration. Pharmacists were rated the lowest by each of the other professional groups. Only 60% of pharmacists rated physicians as high or very high.

Conclusions: Collaboration and communication ratings among physicians and nurses appear to be higher in the ambulatory care setting than in the acute care. However, interactions with pharmacists are more problematic; concerns and questions can be interpreted as adversarial communication. Teamwork training that focuses on specific interactions among professional groups should target these concerns.

A pharmacist called the physician to question a medication order. The physician responded: "I'm the doctor; this is the order—just fill it". Then he hung up. Such an interaction, recounted by a pharmacist, highlights the challenges related to teamwork in the delivery of healthcare. Pharmacists in this study reported unfortunately, "We are often seen as the police, rather than colleagues." This vignette emphasizes one of the difficulties with healthcare professional interactions.

The importance of teamwork and its two subsets collaboration and communication is well established in the patient safety literature. The U.S. Institute of Medicine (IOM) called for promoting effective team functioning as one of five principles for creating safety systems in health care organizations.[1] The exploration of teamwork within the comprehensive rubric of safety climate has been accomplished in hospitals and specific inpatient units.[2,3] For example in a study that targeted physicians and nurses who worked in intensive care units, 73% of physicians rated collaboration and communication with nurses as high or very high. By contrast only 33% of nurses rated collaboration and communication with physicians as high or very high.[2] Similar results were noted among operating room personnel, with surgeons rating operating room (OR) nurses high or very high in communication and collaboration 87% of the time and OR nurses rating surgeons similarly only 48% of the time.[3] Studies evaluating perceptions of teamwork, specifically collaboration and communication, have not generally included descriptions of other professional groups, such as nurse practitioners or pharmacists, nor have they targeted the ambulatory care arena.

The case for focusing on safety climate in ambulatory care is compelling. The volume, the error rate, and injury rate in ambulatory care require close examination of teamwork if safe

patient care is to be advanced. An estimated 1.2 billion visits are made annually to outpatient venues.[4] From another study, almost 25% of the U.S. population visits a physician's office in a month as compared to 8% who are hospitalized; less than 1% is hospitalized in an academic medical center.[5]

Ambulatory care is also linked to errors that result in injury. A population-based study determined that the number of national hospital admissions in the U.S., related to preventable adverse events in ambulatory care, is 75,858.[6] Ten percent of these events resulted in death or serious permanent harm, higher than HIV infections or uterine and cervical cancer combined.

Professionals working in ambulatory care understand these numbers. The very nature of medicine in primary care is episodic by definition, characterized by patients' frequently presenting with early manifestations of illness, with psychosocial problems and other physical co-morbidities.[7] Studies of safety concerns in ambulatory care indicate that disjunctions in communication and collaboration among professionals and even patients may result in omitted or delayed care and diagnosis error.[8-16] One estimation of the extent of these process failures, such as miscommunication and treatment delivery lapses, account for 85% of total errors.[17]

Fragmentation across clinics and services can create patient safety challenges particularly because the primary care team must function well in terms of collaboration and communication. Such concepts fall within the rubric of safety climate and have been measured in hospital units using such validated instruments as the Safety Attitudes Questionnaire or precursors to it.[2,3] To date, assessments of safety climate in ambulatory care facilities using the SAQ have not been accomplished. For the purpose of this publication, one research question was considered: Is there a difference in the perception of professional groups working in ambulatory care clinics, specifically physicians, nurses, nurse practitioners, and pharmacists, in terms of safety climate and communication and collaboration?

METHODS

This research was conducted at four Air Force clinics in the Midwestern United States using the Safety Attitudes Questionnaire (SAQ), Ambulatory Version.[18] Subjects included all professional primary care staff: physicians, advanced practice nurse practitioners, registered nurses, and pharmacists. Outpatient Operating Room staff was excluded.

The SAQ is a refinement of the Intensive Care Unit Management Attitudes Questionnaire, which was adapted from the Flight Management Attitudes Questionnaire.[3] It is a single-page, double-sided questionnaire with 77 total items: 14 questions related to communication and collaboration among professional groups and 63 questions on safety attitudes (38 of which are divided into six subscales). The six subscales that comprise the majority of the instrument are the following: Teamwork Climate, Safety Climate, Perception of Management, Job Satisfaction, Working Conditions, and Stress Recognition. The questionnaire takes 10-15 minutes and asks the respondents to describe the quality of collaboration and communication among 14 professional groups, using a 1-5 Likert scale with categories from very low to very high. The 63 questions related to perceptions of safety use a 1-5-point Likert scale of disagree strongly to agree strongly. Psychometric evaluations of the SAQ determined Cronbach alphas that ranged from .74 to .93.[19-22]

IRB approval from the Air Force and that of the authors' university were obtained prior to conducting the research. Surveys were disbursed through a point of contact at each of the four clinics with an unmarked return envelope to maintain anonymity. The principal investigator traveled to each clinic to discuss the goals of the study, answer questions, and collect the completed surveys.

Statistical Analysis

Professional groups were scored on collaboration and communication based on the percentage of time they were rated "high" or "very high" by other colleagues. Chi-Square analysis was used to compare ratings between and across groups to assess for significant relationships. Multivariate analyses of variance (MANOVAs) were used to compare the four professional groups: physicians, nurses, nurse practitioners, pharmacists on the subscales of teamwork, safety, perception of management, job satisfaction, working conditions, and stress recognition. They were also compared on the 24 questions that were not categorized into a subscale. If the Levene's for homogeneity of variance was significant, then the omnibus F was determined using the Brown-Forsythe. The Least Significant Difference (LSD) post-hoc test was utilized. Due to the multiple comparisons, alpha was set at .025.

The effect size, or eta squared, was also reported. The effect size indicates the amount of total variance in the dependent variable (e.g., subscale scores) that is explained by knowing levels of the independent variable (e.g., professional group).[23] SPSS 12.0 (© SPSS Inc, Chicago, IL) was utilized for all statistical analysis.

RESULTS

An overall response rate of 65% from the 107 participants consisted of nurses (n=46), nurse practitioners (n=12), pharmacists (n=10), and physicians (n=39). The demographics of the professional groups are described in Table A. Nurses were predominately female and tended to be older than physicians and with more years in their specialty. The reliability measure for the scales' internal consistency, Cronbach's Alpha, was acceptable at 0.81.

On measures of collaboration and communication, all groups rated their peer group higher than any other professional group. (Table B). Nurses and physicians gave and received very similar ratings. Physicians rated nurses high or very high in collaboration and

communication 85.7% of the time, while nurses rated physicians high or very high 85% of the time. Pharmacists were rated the lowest by each of the other professional groups, resulting in the lowest overall score of 79.3%. The lowest rating was given to the physicians by pharmacists who rated their collaboration and communication high or very high only 60% of the time. In addition to the chi-square comparison of groups and categories of high and very high, an analysis of variance showed a significant difference between physicians and pharmacists, with each giving the other group the lowest scores (see Table C).

There was no significant difference among professional groups on the total weighted safety score or any of the subscales (Table D). There were, however, five specific questions with significant group differences at the .025 level. These may help illuminate the basis for differences in collaboration and communication ratings among the professional groups and are displayed in Table E. Specifically pharmacists reported significantly higher support to care for patients (p=.013), morale (p=.008), and knowledge of the names of their co-workers (p=.003). Additionally they were less likely to recognize the impact of fatigue on routine performance (p=.008) and more likely to report making errors that had potential to harm patients (p =.001).

DISCUSSION

Earlier studies that have evaluated collaboration and communication among professional groups as part of the safety climate in inpatient units found discrepant attitudes between nurses and physicians.[2,3] This study in the ambulatory care venue did not support that finding. Indeed 85% of registered nurses and 90% of nurse practitioners rated physicians high or very high in collaboration and communication. The close association throughout the day in a clinic environment may enhance the sense of community and promote the professional relationships of physicians and nurses, as compared to acute care settings.

It is important to note that this study indicates that the sense of community may not extend to pharmacists from nurses and physicians. In particular only 60% of pharmacists rated physicians as high or very high in terms of collaboration and communication, and only 70% of pharmacists gave a similar evaluation of registered nurses. Only 74% of physicians and 76% of nurses rated pharmacists as high or very high. An analysis of the means show these ratings of pharmacists, and the pharmacist rating of physicians, to be statistically significantly different at the .025 level (Table C).

Individual question differences from the SAQ indicate that pharmacists in these ambulatory care settings appear to have a different framework through which they view their working environment in terms of support, morale, and familiarity with their co-workers (Table E). Also the nature of the interaction with physicians can often be perceived as adversarial.

A query of pharmacists regarding the difference in collaboration and communication scores with physicians brought forth this comment: "We are often seen as the police, rather than colleagues." Pharmacists in the ambulatory care setting generally call physicians or nurses when they perceive there is a problem with a medication order. Pharmacists may have a very low threshold for concern regarding medications since they report making errors with the potential to harm patients, and this experience may contribute to strained interactions. (Question 44, Table E, $p = .001$).

Discrepancies in perceptions can result in teamwork problems such as communication breakdowns, handoff issues, conflict among clinical staff, and failures to clearly specify responsibilities. A recent examination of closed malpractice claims indicated that such teamwork issues were involved in 70% of the total errors; a quarter of the breakdowns in communication involved nurses, pharmacy and laboratory staff, and entities beyond specific institution.[24] This ambulatory care study clearly supports this finding. The value of the team is

emerging as a key component in safety, according to Lucian Leape, eminent scholar on matters related to patient safety.[25]. A greater team focus must include greater attention to the interactions of all the professional groups with each other.

Strengths and weaknesses of the study

This study is one of the first to target ambulatory care venues for purposes of analyzing attitudes toward collaboration and communication. Within the broader infrastructure of the Department of Defense Military Health System, the sample of four clinics with similar demographics and location represent 7% of the Air Force ambulatory care venues. Furthermore the Safety Attitudes Questionnaire, although used in studies of inpatient staffs, has not been widely utilized in any outpatient settings.

Although some may question the generalizability of this study to civilian institutions regarding safety climate, the professional categories examined here are comparable. Certainly the findings can inform civilian institutions for development of teamwork training programs.

Implications for research and policy

This study could certainly be replicated in other military ambulatory care facilities as well as civilian ambulatory care venues. In terms of policy development, the increasing emphasis on teamwork training should target specific interactions among such groups as physicians and pharmacists, as well as nurses and pharmacists. Future interdisciplinary education and team training should assist professional groups to improve their understanding, appreciation of differing paradigms, and work experience of each other in order for collaboration and communication to improve and for overall patient safety to be enhanced. Perhaps one day, when it comes to questions regarding patient safety, no one profession will hang up on another.

Table A. Demographic variables by professional

	Physicians (n = 39)	Registered Nurses (n = 46)	Nurse Practitioners (n =12)	Pharmacists (n=10)	Overall (N=107)
Gender (% Male)	76.9*	10.9*	8.3	60.0	39.6
Ethnicity (% White)	87.2	80.4	100.0	80.0	89.2
Age (Mean ±SD)	38 ± 9*	43 ± 7*	43 ± 4	38 ± 11	41 ± 8
Years in Specialty (Mean ±SD)	8.1± 7.1*	13.0 ± 9.7*	10.5 ± 6.7	12.8 ± 11.9	10.8 ± 8.9
Years at current clinic (Mean ± SD)	2.6 ±1.2	3.1 ± 3.2	2.2 ± 1.7	2.2 ± 1.3	2.7 ± 2.2

*Physicians and nurses differ significantly on gender (p<.001), age (p=.004) and years in specialty (p=.014); no other groups have statistically significant inter-group differences (p>.025)

Table B. Percentage of each professional group rating other group "high" or "very high" on collaboration and communication.

Group Being Rated	Group performing the rating				
	Physician (n=39)	Registered Nurse (n=46)	Nurse Practitioner (n=12)	Pharmacist (n=10)	Overall (n=107)
Physician	88.6	85.0	90.9	60.0	84.4
Registered Nurse	85.7	87.8	90.0	70.0	85.4
Nurse Practitioner	82.8	86.5	100.0	90.0	87.2
Pharmacist	74.3	76.3	90.0	100.0	79.3

*No statistically significant inter-group differences (p>.025)

Table C. Mean differences of professional groups on collaboration and communication

Group Being Rated	Group performing the rating				
	Physician (n= 35)	Registered Nurse (N=41)	Nurse Practitioner (N=11)	Pharmacist (N=10)	Overall
Physician	4.4 ±.9	4.5± .8	4.6 ± .9	3.6 ± 1.2*	4.4 ±.9
Registered Nurse	4.3 ±.0	4.7 ± .8	4.5± 1.0	3.9 ±.7	4.4±.8
Nurse Practitioner	4.3 ±.9	4.3±.8	4.9 ± .3	4.5± .7	4.4 ±.8
Pharmacist	4.0 ±1.0*	4.1±.8 *	4.4±.7	4.9 ±.3	4.2 ±.9

***Differences are significant at the .025 level. Alpha adjusted to control for familywise alpha inflation**

TABLE D COMPARIONS OF PROFESSIONAL GROUPS ON SUBSCALES

	Physicians M ± SD	Registered Nurses M ± SD	Nurse Practitioners M ± SD	Pharmacists M ± SD	Total M ± SD
TEAMWORK	70.7 ± 21.7	72.9 ± 20.7	74.2± 16.5	73.2 ± 8.6	71.8 ± 19.9
SAFETY	78.2 ± 19.1	79.0± 14.1	83.6 ± 16.1	83.6 ± 10.8	79.7± 16.1
PERCEPTIONS OF MANAGEMENT	73.0 ± 23.5	74.7 ± 19.6	74.1 ± 20.7	82.5 ± 14.4	74.6 ± 20.8
JOB SATISFACTION	64.4± 27.9	69.1 ± 21.7	65.8 ± 22.2	81.5 ± 23.6	68.1 ± 24.6
WORKING CONDITIONS	62.5 ± 19.4	65.6 ± 15.1	71.6 ± 10.7	71.4 ± 17.7	65.4 ± 16.9
STRESS RECOGNITION	66.0 ± 20.0	59.5 ± 21.0	68.8 ± 14.1	80.2 ± 17.4	64.7 ± 20.3

No significant differences at the .025 level for any subscale. Alpha adjusted for familywise alpha inflation

Table E. Individual questions demonstrating statistically significant inter-group differences by professional group (mean +/- Standard Deviation)

	Physicians	Registered Nurses	Nurse Practitioners	Pharmacists
Q34 - I have the support I need from other personnel to care for patients	3.7 ± 1.2	4.0 ± .9	3.5 ± 1.0	4.7 ± 0.7 (effect size=.09)
Q41 - Morale in this office is high	2.5 ± 1.4	3.0 ± 1.3	2.6 ± 1.4	4.1 ± 1.0 (effect size=.09)
Q43 - I know the first and last names of all the personnel I worked with during my last shift	3.7 ± 1.5	4.4 ± 1.0	4.7 ± 0.9	4.7 ± 0.7 (effect size=.10)
Q44 - I have made errors that had the potential to harm patients	3.0 ± 1.5	2.1 ± 1.5	2.1 ± 1.4	3.8 ± 1.3 (effect size = .15)
Q57 - Fatigue impairs my performance during routine care	3.2 ± 1.4	2.5 ± 1.5	3.8 ± 1.2 (effect size = .10)	2.8 ± 1.2

All questions significant at the .025 level. Alpha adjusted to control for familywise alpha inflation

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TITLE PAGE

Title:
Inseparable but Explicit: Safety Climate as a Snapshot of Culture in Primary Care

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ABSTRACT

The development of a culture of patient safety is a goal for Department of Defense healthcare facilities, and safety climate assessment provides a snapshot of safety culture. Safety climate research has been rare in ambulatory care facilities. This study measured safety climate among primary-care staff in selected Air Force ambulatory-care facilities using an established instrument, the Safety Attitudes Questionnaire. A total of 213 responses were received. One clinic scored significantly higher on the total safety-climate score than the other three clinics ($F [3,199] = 7.0$, $p < 0.001$). An analysis of the instrument scores and the respondents' comments revealed concerns related to staffing as well as to training and length of time that support staff are assigned to an area; problem resolution was also a critical concern. To advance the culture of safety, military healthcare leaders would do well to focus on thorough training and problem resolution.

INTRODUCTION

Calls for ensuring the establishment of a culture of patient safety in healthcare institutions have now become ubiquitous. Both the Department of Defense and the Institute of Medicine have recognized the necessity of such efforts as a guide to policy development and training programs.[1-2] This focus on safety culture and its major measurement tool, safety climate assessments, has generated substantial interest and research in these areas, but primarily in inpatient-hospital units such as Intensive Care and the Operating Room. However, the majority of patient care provided on any one day in civilian institutions, and within the U.S. Air Force Medical Service, is delivered by primary care staff in ambulatory care facilities. There is a dearth of research regarding patient safety climate in these outpatient venues, and this study proposes to close that gap.

If one examines the historical context of both safety culture and safety climate, one discovers both have been explored and discussed in industry for years. [3] The term safety culture was first used by the International Atomic Energy Agency in 1986 in its summary report on the Chernobyl nuclear-power-plant accident.[4,5]

Culture in general encompasses such broad, comprehensive notions as values, beliefs, underlying assumptions, and practices (consisting of rituals, symbols, and heroes) in an organization. Culture can be considered functional in that it can be a guide for behavior; it also has been described by the clear and often-utilized maxim as the way we do things around here.[6] One author posits that safety culture is embedded within the larger framework of the organizational culture and describes the former as “those aspects

of the organizational culture which will impact on attitudes and behavior related to increasing or decreasing risk" [4] [p.251]. Safety culture is considered an important distinction within organizational culture because what has been written down in terms of safety policies, procedures, instructions, etc., is not always what is actually practiced in reality.[3]

A number of definitions of safety culture can be found in the industrial literature, but a comprehensive and eloquent approach that may be the most useful to healthcare is the list of elements of a good culture of safety espoused by Hale in 2000:

- "Safety is considered by all, especially top managers, to be a goal, and a shared purpose, with other organizational goals, and safety actions are rewarded even if they cost time and money.
- People have creative mistrust, are always expecting new problems, or old ones in new guises, and are never convinced the state of safety is ideal. There must be explicit provision for whistleblowers.
- All parties have caring trust in each other . . .. all will help cope with inevitable slips and blunders. This leads to overlapping and shared responsibility.
- Openness in communication (exists), to talk about failures as learning experiences; imagine and share new dangers . . .. .blame only in the case of unusual thoughtlessness or recklessness . . this can drive a responsible learning culture.
- Causes for accidents and opportunities for safety improvements should be sought in the interaction of many causal factors, not just

in individual behavior. Solutions and safety improvements can be be sought in many places and be expected from many people.

- The integration of safety thinking and action into all aspects of work practice, so that *it is seen as an inseparable, but explicit part of the organization."* [7] (italics added--p12—13)

Another important insight offered by Hale is that of the notion of subcultures in organizations. An example from industry is the engineering culture that conflicts with the operation staff. Perhaps organizations should not expect one common culture for safety but rather should seek to find ways to blend several distinct subcultures into a complementary whole.[7]

The corollary construct of "safety climate" has arisen as the term used when psychometric questionnaire studies are employed to measure the aggregated-employees' attitudes at a particular moment in time.[8] These collective attitudes and perceptions provide a snapshot or indicator of the organization's underlying safety culture.[8-10] Safety climate, which has been said to be a product of safety culture, is also valuable as an alternative, performance indicator that can be used to complement audits, accidents, and near-miss reports.[3,4] The safety-climate questionnaire has been the major method for measuring safety culture.[11]

The use of safety-climate surveys in hospitals can be traced to 1995 with questions related to adherence to universal precautions, which were part of a longer questionnaire.[9] More recently researchers have turned their attention to the development and analysis of distinct, safety-climate instruments, in the US and abroad.[10,12-14]

One analysis of patient-safety-climate instruments, which included a comparison of nine surveys, reported that the Safety Attitudes Questionnaire (SAQ) had both sound psychometrics and reported correlations between safety-climate and patient outcomes.[15] The SAQ is reported to be the most widely used, cultural-assessment tool in health care.[16]

Patient-safety-climate research has generally reported on inpatient-hospital units. For example the SAQ was utilized with Operating Room personnel in 60 hospitals. Only one out of six subscales was reported---the teamwork climate, which differed significantly by hospital and OR job category. The one question in the teamwork subscale with the lowest overall mean score was related to disagreements, with only 53% of caregivers stating that disagreements were resolved appropriately.[17]

Similar findings were reported from a large study of labor and delivery units in 44 hospitals, also using the SAQ-teamwork climate scale. Labor and delivery staff perceived teamwork differently as a function of their role and as a function of the hospital in which they worked.[18] Specific concerns that were stated related to the heeding of nurse input, physician-nurse collaboration, conflict resolution, and ease in asking questions. Among perinatologists and neonatologists, 74% noted that disagreements were resolved appropriately, as compared to 44% of Certified Registered Nurse Anesthetists.[18] The researchers noted that poor team climate (and its concomitant poor communication) is often listed as a root cause of medical error.

The SAQ was also utilized to assess perceptions of safety culture in four Intensive Care Units (ICUs) in one tertiary-care hospital. The observation from industry that individual units can vary substantially, even within the same organization, was supported with this research. Overall, safety-climate scores from the ICUs were low to moderate,

with means of 43—74 (positive score is 75), and showed significant differences among the four units, except for stress recognition ($p<.008$). The top four recommendations, comprising 71% of the written comments, called for the improvement of the following: staffing (35%), education (12%), teamwork (12%), and education (12%).[19]

The majority of safety-related, medical research has been performed in inpatient settings, and as a consequence, a gap in the literature exists concerning a clear understanding of the patient-safety climate in ambulatory-care facilities or clinics. Considering that three-fourths of the medical care provided in the Air Force Medical Service is delivered in clinics without inpatient capacity, one can see that research which explores patient-safety climate in these venues would contribute to the literature and our understanding of safety culture in these venues.

A system-wide survey conducted by the Department of Defense, i.e., the TRICARE Management Activity, was conducted in late 2005 but did not include factors relevant to patient safety such as job satisfaction and recognition of stress. By contrast the SAQ does include these factors, has solid psychometrics, and has been used in a number of studies of inpatient units. This specific research addresses the following questions in the Air Force ambulatory care setting: Are there differences among primary care staff in terms of their overall perceptions of the patient safety climate? Additionally what suggestions do Air Force primary care staff members have to improve patient safety in their specific facilities?

METHODS

Sample

This research was conducted at four Air Force ambulatory care facilities in the Midwestern United States using the Safety Attitudes Questionnaire (SAQ), Ambulatory Version.[20] Subjects included all professional, primary-care staff: physicians, nurse practitioners, physician assistants, registered nurses, pharmacists, and technicians (N=213). Ambulatory surgical, administrative, and executive leadership staff were excluded. A description of the four facilities and the respondents is detailed in Table I.

Instrument

The SAQ is a refinement of the Intensive Care Unit Management Attitudes Questionnaire and was adapted from an aviation questionnaire.[20] It is a single-page, double-sided questionnaire with 77 total items: 14 questions related to communication and collaboration among professional groups in addition to 63 questions on safety attitudes. The questions related to perceptions of safety use a 1-5-point Likert scale of disagree strongly to agree strongly. A portion (38) of the safety attitudes questions are divided into six subscales measuring the following: Teamwork Climate, Safety Climate, Perception of Management, Job Satisfaction, Working Conditions, and Stress Recognition. Definitions of each of the subscales or factors from the SAQ users' manual, in addition to examples of items, are listed in Table II.[20] The final section of the instrument has an open-ended question where respondents are asked for three recommendations for improving patient safety in that facility. Previous psychometric evaluations of the SAQ determined Cronbach alphas that ranged from .74 to .93.[20-22]

This instrument was selected for three reasons: its strong psychometric properties, its established use in the safety climate literature, and its ambulatory version.

Data Collection

IRB approvals from the Air Force and from the authors' university were obtained prior to conducting the research. Surveys were disbursed through a point of contact at each of the four clinics with an unmarked return envelope to maintain anonymity. The principal investigator traveled to each clinic to discuss the goals of the study, answer questions, and collect the completed surveys.

Statistical Analysis

A series of analyses of variances (ANOVAs) was run comparing the four clinics on the total safety score, the six subscales, and the 24 questions that are not categorized into a subscale. Two 2-way ANOVAs were completed to compare the impact of gender and position with clinics on the total safety score. In addition analyses of covariances (ANCOVAs) were computed controlling for age, staff members years in the clinic, and years in the specialty. If the Levene's for homogeneity of variance was significant, then the omnibus F was determined using the Brown-Forsythe F. The Least-Significant-Difference (LSD) and Dunnett post-hoc tests were both utilized; due to the multiple comparisons, alpha was set at the .03 or below to correct for familywise alpha inflation. The qualitative section was analyzed by themes. The statistics were calculated using SPSS 12.0 (© 2004, SPSS, Inc, Chicago, IL).

RESULTS

A total of 213 primary-care staff responded, (Clinic 1: n=28, Clinic 2: n=42, Clinic 3: n=95 and clinic 4: n=48) for an overall response rate of 65%. The Cronbach's alpha,

measure of the scale's internal consistency or reliability, was an acceptable 0.83, higher than the recommended 0.7.[23]

A score of 75 or greater is considered positive.[21] Clinic 1 was the only clinic to score positively and had the highest mean, total-climate score at 80.2. It was significantly higher than any of the other clinics (Clinic 2 - 65.5, Clinic 3 - 69.9, Clinic 4 - 68.6, all p values <.03). In addition Clinic 1 reported more positive ratings for teamwork, safety climate, perceptions of management, job satisfaction, and working conditions. The only scale on which it did not excel was stress recognition (complete results appear in Table III).

Each subscale was analyzed to determine more precisely which questions/themes were driving the differences between primary-care staffs with a positive, safety-climate score and others with lower scores (see Table IV). For the first subscale of teamwork, the differences lie in the areas of physician and nurse interactions, the utilization of staff input, and the resolution of disagreements. For example Clinic 1 had significantly higher (more positive) scores on the issue of resolving disagreements appropriately (#24) when compared to each of the other three clinics: (M=4.25; F [3,208] = 3.3, p=.022).

Other subscales with items that proved particularly revealing were perception of management and working conditions (see Table IV). Question #26 asked about the provision of adequate, timely information concerning events that affect an individual, staff-member's work. Clinic 1 again displayed more positive attitudes than the others: (M=4.0); F ([3,207]=3.1, p=.027).

The working conditions subscale indicated both concerns with staffing (#18) and also with the issue of constructively resolving problems that involve physicians and other

employees (#22). Question #42 addressed the important issue of training and supervision that is repeated numerous times in the comments of the respondents. Again Clinic 1's responses were the most positive: (M=4.4); F ([3,184] =4.6,p=.004).

Questions related to job satisfaction followed a similar pattern and seem to be a logical consequence of the teamwork, management, and working-condition responses. Clinic 1 respondents report higher morale and pride in working at that facility.

An analysis of the 24 questions on the SAQ that were not loaded on one of the six subscales revealed only four that showed significant differences among the four clinics (Table IV, additional questions). Of particular note (and also emphasized in the written comments) is the issue of the perception of support from colleagues. Specifically question 34 stated: "I have the support I need from other personnel to care for patients." All staff at Clinic 1 responded at the agree strongly or agree slightly level, (M=4.5); (F [3,203] =6.2, p <.001).

An analysis of possible, intervening variables that could potentially contribute to the differences among the clinics revealed that gender was not significant (p=.996). There was also no significant interaction of gender and clinic (p=.206). Furthermore job position was not an explanation for difference (p=.217), nor was there a significant interaction of position and clinic (p=.432).

Three additional confounding variables were explored. The first of such variables was years in the specialty. To answer the question whether years in the specialty could explain the differences among the clinics, an analysis of covariance (ANCOVA) was completed. After controlling for years in the various specialties, Clinic 1 remained

significantly different from the other three clinics: (M=80); (F [3,185] = 6.4, p <.001). Years in the specialty, i.e., the covariant, was not significant (p=.06).

A second possible confounding variable, the respondents' years at their clinic, was computed with another ANCOVA analysis. The previous results regarding Clinic 1 were confirmed again with this datum point. The difference in the clinics was sustained (p=.001), after controlling for years at the clinic, but the confound of years at the clinic was not significant in terms of the total-weighted-safety score (p=.85).

A final ANCOVA was completed to determine whether the clinics were significantly different, after controlling for age. The significant difference continued for Clinic 1, after controlling for age (F [3,180] =7.1; p=.001). The covariate age did show a significant relationship with the total safety score (p <.001), and this finding will be addressed in another paper.

QUALITATIVE RESULTS: What did the staff say?

The last section of the SAQ asked for qualitative data by specifically asking the following: *What are your top three recommendations for improving patient safety in this office?* Three lines were provided for respondents to write in their ideas. Of the 213 respondents, 77 (36%) provided 166 comments. The comments were divided into units of meaning (or idea categories) using the qualitative technique of content analysis.[24] The categories corresponded to the subscales on the quantitative portion of the SAQ. The number of those who made comments as a percentage of total respondents from each clinic were as follows: Clinic 1—32%, Clinic2---40%, Clinic 3---38%, Clinic 4---31%. The clinic with the lowest overall safety-climate score (Clinic 2) had the

highest percentage of respondents writing comments. Examples of comments that were particularly germane are listed in Table V.

Three categories of comments together constituted 63% of the total. The first and largest category dealt with the issue of working conditions, specifically staffing and requests for increased manpower. This one concern constituted 23% of all comments; 33% of the comments came from physicians, more than any other professional group. In addition Clinic 1, with the highest, overall safety score, made only one out of the 38 total comments, which stated that improving staffing would enhance patient safety. These comments triangulate with #18 of quantitative questions, which asked whether staffing was sufficient to handle the number of patients. Clinic 1 had the second highest mean score (M=3.4), and Clinic 2 had the lowest mean score (M=1.9; $p<.001$), (see Table IV).

However, the request for more staff does not tell the whole story. The second large category of comments from respondents referred to another component of working conditions, that of training and utilization of the staff. Thirty-two comments were made (19% of the total) that requested improved and consistent training, primarily for technicians. In addition there were also several requests to reduce turnover---to leave staff in place for greater than 24 months. Technicians provided 35 % of the comments concerning training, greater than any other professional group. Specific recommendations included statements that strong individuals should orient newcomers; in addition a mentoring program should be in place for junior staff (see Table V). These comments also triangulate and reinforce the quantitative issue from question #42, which refers to trainee supervision. Once more, Clinic 1, which had the highest, overall safety score, also scored highest in this area (M=4.4), compared to Clinic 2, which had the lowest,

overall safety score and which also scored the lowest in terms of supervision (M=3.4; p=.004).

The third and final large category of comments was one categorized as perceptions of management. In this category, the major issue was communication. Twenty-eight respondents made 34 comments, for 20% of the total comments. The request by staff, including physicians, to have regular allotted time for meetings (see Table V) is a particularly precise recommendation regarding communication. One respondent complimented the use of huddles (regular, brief updates) and hand-off strategies. Clinic #1 made 18% of the comments in this category, indicating that those facilities with a strong safety climate have concerns related to communication. However, once more, the clinic with the lowest overall scores, Clinic 2, accounted for 24% of the comments in this area. The qualitative comments also triangulate or confirm the quantitative finding regarding communication from question #26: "I am provided with adequate, timely information about events in the office that might affect my work." Clinic 1 had the highest mean (M-4.0). All other clinics had lower scores, (M=3.3, p =.027). One of the specific requests regarding information flow was that of reporting near misses so others may learn from them.

The final important component of the comments regarding management had to do with problem resolution. Two particularly passionate statements from respondents stated that they reported concerns and saw no action taken; neither of these came from Clinic 1. One respondent made the point in a particularly poignant manner: "Stop putting Band-Aids over personnel problems." A comparable question (#22) from the quantitative working-conditions subscale reinforced this concern with problem resolution: "This

office constructively deals with problem physicians and employees." As with the other two major areas of comments, Clinic 1 had the highest scores in this area (M=3.9), and Clinic 2 had the lowest (M=2.9, p = .001).

DISCUSSION

These four clinics are similar in demographics, mission, and resources. One clinic, however, differed from the three other clinics in that it has a more positive, patient-safety-climate score. Taking a closer look at the subscales that make up the SAQ and the comments from the staff offer some revealing, helpful explanations of what elements create a positive, safety climate.

Safety climate is a composite, a mosaic. Sufficient staff to handle the patient load in a safe manner is a critical component of that mosaic. The clinic with the highest safety-climate score had the fewest negative comments regarding staffing and also had a high rating for that question (see #18, Table IV). On the other hand, it is not just the numbers that matter. The staff must be trained, adequately and thoroughly supervised by qualified staff, and preferably kept in their positions for at least two years.

Finally, management at all levels must work to ensure that communication flows in all directions and that it be timely and adequate, particularly if such information affects those providing direct patient care. In addition such communication should include what is learned from mistakes and near-misses. These vital lessons must be disseminated broadly---beyond the safety staff and the executive team. Equally important, management must ensure that problems are resolved, particularly those dealing with personnel. The clinic with the best overall safety-climate score got the highest marks in this area, and the lowest-scoring clinic produced comments such as "my concerns were

dismissed and no action was taken." This conflict resolution can be a critical contribution to meshing the primary-care staff and enhancing the overall safety culture.

This research confirms findings in the broader safety literature that safety culture is comprised of subcultures; culture must be evaluated at the work-unit level within an organization, and management attitudes and practices are crucial.[7,8,16,25] The findings related to staffing, education, teamwork, and conflict resolution from studies of safety climate in inpatient units are also confirmed from this study of primary care staff.[19] This research, however, adds the important specificity that education within Air Force facilities can be enhanced by longer assignments to a specific clinic. Moreover this study adds the striking emphasis that management must ensure that conflict resolution occurs if staff are to have confidence in the organization's commitment to building a safety culture.

The leadership of military healthcare facilities deal with issues related to communication and problem resolution every day. It is not new to hear exhortations for improvements. What leaders must recognize, however, is that such issues are not just good management; they provide a better environment for patient safety. Staffing authorizations and assignments are generally handled at levels beyond that of the individual, military-healthcare facility and hence cannot be controlled by the local leadership. Nevertheless, ensuring adequate training, supervision, communication flow, and problem resolution are all within the power of local leadership and should be considered high priorities every day. And leaders should understand organizations are defined, not only by what they pay attention to, but also by what they ignore.[5] Military-healthcare leaders should pay attention to all these features, so that ultimately, the culture

of safety in the Department of Defense can be built and sustained, and can be part of the broader, organizational culture in ways that are both "inseparable, but explicit." [7]

Table I. Descriptions of Participating Primary Care Staff From Four Ambulatory Care Facilities

	Clinic 1 n = 28	Clinic 2 n = 42	Clinic 3 n = 95	Clinic 4 n=48	Total n= 213
Respondent Roles					
Physician	4	4	25	5	38
Nurse	7	8	20	11	46
Technician (Certified Nurse Assistant)	14	23	41	25	103
Physician Assistant	1	1	0	2	4
Nurse Practitioner	1	4	5	2	12
Pharmacist	1	2	4	3	10
Response Rate	46%	82%	62%	74%	65%
Facility Characteristics					
Annual Operating Budget (in million $)	$8.7	$8.8	$32.9	$8.5	$58.9
Patients Enrolled to Facility	11, 055	11,639	29,977	11,000	63,671
Outpatient Visits in 2006 (not dental)	48,864	34,751	165,480	50,158	299,253

TABLE II. Safety Attitudes Questionnaire: Ambulatory Version Subscales And Examples [20]

SUBSCALE (FACTOR) DEFINITIONS	EXAMPLE ITEMS
***Teamwork climate*: perceived quality of collaboration between personnel (6 items)**	♦ **Disagreements in this office are resolved appropriately (not who is right, but what is right for the patient)** ♦ **The physicians and nurses work together as a well-coordinated team**
***Job Satisfaction;* Positivity about the work experience (5 items)**	♦ **I like my job** ♦ **Morale in this office is high**
***Perceptions of management*: approval of managerial action (5 items)**	♦ **Senior management in this office is doing a good job** ♦ **I am provided with adequate, timely information about events in the office that might affect my work**
***Safety Climate:* Perceptions of a strong and proactive organizational commitment to safety (7 items)**	♦ **I would feel safe being treated here as a patient** ♦ **Medical errors are handled appropriately in this office**
***Working Conditions:* Perceived quality of the work environment and logistical support (9 items)**	♦ **The levels of staffing in this office are sufficient to handle the number of patients** ♦ **Trainees in my discipline are adequately supervised**
***Stress Recognition:* Acknowledgement of how performance is influenced by stressors (6 items)**	♦ **I am less effective at work when fatigued** ♦ **I have made errors that had the potential to harm patients**

TABLE III – Comparison of Safety Attitudes Questionnaire total weighted safety and subscale scores by primary care staff from each ambulatory care facility (clinic)

	Clinic 1 n= 28	Clinic 2 n=42	Clinic 3 n=95	Clinic 4 n=48	Total n=213
Total Weighted Safety Score	80.2 ± 13.1	65.5* ± 15.3	69.9* ±12.7	68.6 * ± 13.3	70.2 ±14.0
Subscales					
Teamwork	78.9 ± 15.8	64.5 * ± 22.2	68.9 ± 18.5	64.9 * ± 18.6	68.7 ± 19.3
Safety	87.9 ± 11.7	74.0 * ±18.9	80.3 ± 13.1	78.3 * ± 15.6	79.5 ± 15.3
Management	85.7 ±15.6	68.9 * ± 22.7	75.0 ± 19.0	67.7* ± 21.9	73.6 ± 20.6
Satisfaction	80.6 ±21.0	58.2 * ±25.3	65.1* ± 24.7	69.7 ± 23.7	66.7 ± 24.8
Working Conditions	73.7 ~ ± 20.1	61.0 * ±18.3	64.4 ± 15.1	70.7 ± 17.5	66.0 ± 17.1
Stress Recognition	57.9 ± 22.7	60.9 ± 21.7	62.1 ± 18.6	50.0 ± 18.2	58.7 ± 20.1

*** Significant Difference from Clinic 1 at the .03 level using Dunnett-t Post-Hoc**

TABLE IV. Individual questions from subscales demonstrating statistically significant inter -group differences by primary care staff from each ambulatory care facility or clinic (mean +/- Standard Deviation)

	Clinic 1	Clinic 2	Clinic 3	Clinic 4
TEAMWORK SUBSCALE (#3, 19,24,38):				
#3 Nurse input is well received in this office	**4.6+/-.68 ***	**3.7+/-1.2**	**3.9+/-1.1**	**4.0+/-.99**
#19 Decision making in this office utilizes input from relevant personnel	**4.1+/- 1.1 ***	**3.3+/-1.5**	**3.7+/-1.3**	**3.1+/-1.3**
#24 Disagreements in this office are resolved appropriately	**4.3+/-1.0 ***	**3.5+/-1.1**	**3.7 +/-1.2**	**3.5+/-1.3**
#38 The physicians and nurses here work together as a well-coordinated team	**4.5 +/-.58 ***	**3.9+/-1.2**	**3.8 +/-1.0**	**3.8+/-.83**
SAFETY CLIMATE SUBSCALE (#4)				
#4 I would feel safe being treated here as a patient	**4.8 +/-.49 ***	**4.1+/-.93**	**4.4+/-.87**	**4.4+/-.82**
PERCEPTION of MANAGEMENT SUBSCALE (#9,10, 17, 26)				
#9 Senior management of this office is doing a good job	**4.39 +/-1.0***	**3.2+/-1.5**	**3.8+/-1.2**	**3.5+/-1.4**
#10 Management in this office supports my daily efforts	**4.4+/-1.0 ***	**3.5+/-1.4**	**3.9+/-1.1**	**3.5+/-1.4**
#17 Office management does not knowingly compromise the safety of patients	**4.7 +/- .75 ***	**4.1+/- 1.2**	**4.6 +/- .84**	**3.9 +/-1.4**
#26 I am provided with adequate, timely information about events in the office that might affect my work	**4.0 +/- 1.1 ***	**3.3+/-1.1**	**3.3+/-1.2**	**3/3+/-1.1**
JOB SATISFACTION SUBSCALE (#8,15,29,41)				
#8 Working in this office is like being part of a large family	**3.9+/-1.2 ***	**3.1+/-1.3**	**3.7+/-1.2**	**3.6+/-1.2**
#15 This is a good place to work	**4.5+/-.79 ***	**3.5+/-1.3**	**3.8+/-1.3**	**3.9+/-1.1**
#29 I am proud to work here	**4.7+/-.72 ***	**3.9+/-1.1**	**3.9+/-1.2**	**4.1+/-1.0**
#41 Morale is high	**3.8+/-1.4 ***	**2.4+/-1.3**	**2.7+/-1.4**	**2.9+/-1.3**
WORKING CONDITIONS SUBSCALE (#18, 22, 42)				
#18 Levels of staffing are sufficient to handle the number of patients.	**3.4+/-1.4 ***	**1.9+/-1.2**	**2.0+/-1.2**	**3.5+/-1.4**
#22 This office constructively deals with problem physicians and employees	**3.9+/-1.3 ***	**2.9+/-1.4**	**3.5 +/-1.1**	**3.0+/-1.3**

TABLE IV (continued)
Individual questions from subscales demonstrating statistically significant inter-group differences by primary care staff from each ambulatory care facility or clinic (mean +/- Standard Deviation)

	Clinic 1	Clinic 2	Clinic 3	Clinic 4
WORKING CONDITIONS SUBSCALE				
#42 Trainees in my discipline are adequately supervised	**4.4+/-1.0 ***	**3.4+/-1.4**	**3.7+/-1.1**	**3.7+/-1.2**
STRESS RECOGNITION SUBSCALE (#25)				
#25 When my workload becomes excessive, my performance is impaired	**3.6+/-1.4 ***	**3.2+/-1.4**	**3.7+/-1.3**	**2.9+/-1.5**
ADDITIONAL QUESTIONS				
# 34 I have the support I need from other personnel to care for patients	**4.5 ± .81 ***	**3.5 ± 1.1**	**3.8 ± 1.2**	**4.1 ± .82**
#43 I know the first and last names of all the personnel I worked with during my last shift	**4.5 ± .89**	**4.6 ± 1.1**	**3.9 ± 1.4 ***	**4.5 ± .99**
#47 I am fatigued when I have to get up in the morning and face another day on the job	**2.3 ± 1.4 ***	**3.2 ± 1.4**	**3.2 ± 1.4**	**2.8 ± 1.3**
#57 Fatigue impairs my performance during routine care	**2.2 ± 1.3 ***	**2.9 ± 1.3**	**3.0 ± 1.3**	**2.4 ± 1.3**

*** Significant difference at the .025 level for Clinic 1 compared to at least one or more of the others.**

TABLE V Specific examples of comments from SAQ

INCREASE STAFFING:
More support staff (repeated three times by same respondent) `
WORKING CONDITIONS---Training/Utilization:
Allow technicians to remain in clinics for >24 months
Less changing of staff---longer time in position
Continuity in staffing
Turnover: 5 personnel in 11 months—not safe/productive for anyone
Implement a mentoring program; we have junior staff (suggested by 2)
Assurance new personnel have strong individuals to orient them
More consistent technician training, more consistent expectations of all techs
More ER/ambulance experience---more hands-on experience for technicians
WORKING CONDITIONS: Equipment
Have TRICARE send the consult info we type in AHLTA to specialists downtown.
Access to information outside workplace (home)
TEAMWORK:
Ask staff who work in area day-to-day
More time for unit cohesiveness/morale building
PERCEPTIONS OF MANAGEMENT:
Open lines of communication; what is discussed at higher levels should flow down
Regular staff meetings; regular nurse meetings; allotted time for meetings
Stop putting band-aids over personnel problems
Easier, quicker method of reporting near-misses/mistakes AND disseminating the info so people can learn from them
Huddles and hand-offs are very helpful
Reality of non-punitive environment
Rotate “safety-monitor” position so all clinic personnel can appreciate it
Ask patients regarding their safety issues and incorporate into clinic plan
Have a truly independent safety representative who isn’t in the chain of command of the Medical Group

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TITLE PAGE

Title:
Patient Safety Climate in Primary Care: Age Matters

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ABSTRACT:

Objective: Safety climate, as a measurement in time of safety culture utilizing a survey instrument, has been explored in inpatient units and among hospitals. Differences have been reported among professional groups in these venues. This study sought to determine if comparable differences exist among professional groups in ambulatory care settings.

Setting: Four U.S. Air Force ambulatory-care facilities (clinics) from the Midwestern United States.

Methods: The Safety Attitudes Questionnaire was selected as the research tool because of its published utilization in inpatient venues, its sound psychometrics (Cronbach Alpha .74-.93), and its ambulatory-care version .

Results: All primary care staff were surveyed yielding 213 responses for a response rate of 65%. There were no significant differences among the professional groups on the total patient safety score or on five of the six subscales. There were, however, significant differences on total safety scores based on age, not professional group, with staff members less than 31 years of age scoring lower on the overall safety score ($M=64.8$; $p<.001$), as compared with the 32-41 age group ($M=74.3$) and those 42-63 ($M=73.8$). The youngest age group also had the lowest scores on the subscales of teamwork climate, safety climate, perception of management, and job satisfaction.(all subscales $p<.03$)

Conclusions: Growing attention has been given to Generation Xers and Nexters, but not within the context of enhancing patient safety. Efforts that address the information, training, and job-satisfaction needs of these specific age groups have the potential to strengthen healthcare teams and contribute to a more positive safety climate.

INTRODUCTION

The radiology technician saw a hip fracture in the emergency-room patient; the emergency-room physician missed it. The technician thought about saying something, but he didn't feel comfortable speaking up to the physician; the diagnosis was missed for several days, and the patient was subsequently admitted to a hospital for surgery following several days of pain. The radiology technician was 25 years old; the physician, 45.

Such a breakdown in communication and teamwork, with its deleterious impact on the patient, is unfortunately far too common in healthcare. The Institute of Medicine (IOM), in its landmark call to action *To Err is Human*, identified the importance of interdisciplinary team training as one of its top priorities for the development of a culture of safety in healthcare organizations, for the explicit purpose of reducing such breakdowns.[1] The IOM recommended that such training involve respect for all team members, as well as listening to all regardless of rank or status and generally aiming to ensure that the flow of information between junior and senior staff cross the "authority gradient." [1] (p.180).

To accomplish these worthy goals related to interdisciplinary and intergenerational staff members, organizations need to assess their current state of operations regarding such safety-culture dimensions as teamwork, generally measured by safety-climate questionnaires. These safety-climate assessments have predominately targeted professional groups from inpatient venues. There is a dearth of research capturing the differences in the perception of patient-safety climate that exists among the various age groups working in the outpatient venue; most research relates to developing survey instruments for ambulatory care.[2-4] This research utilizes a well-established instrument to explore safety climate in ambulatory care and adds to the body of literature on this important topic.

Evaluations of safety culture have been done in Intensive Care Units (ICUs), Labor and Delivery Units, and Operating Rooms, both in the United States and the United Kingdom.[5] One such study, which targeted four intensive-care units in one facility and used the Safety Attitudes Questionnaire (SAQ), reported that nurses had lower scores for working conditions ($p<.001$) and perceptions of management ($p=.001$) than physicians. Additionally ICU nursing directors overestimated the teamwork score of their staffs by 16 percent.[6] Another study comparing nurses and physicians who worked in ICUs reported similar findings. Specifically several issues related to teamwork were problematic for nurses relative to physicians: nurses reported that it is more difficult to speak up ($p=.006$), disagreements are not appropriately resolved ($p=.004$), and nurse input is not well received ($p <.001$).[7]

The differences in perception of teamwork climate based on professional role were also found among labor and delivery staff from 44 hospitals, again using the Safety Attitudes Questionnaire teamwork climate scale. Nurses, as compared with physicians, perceived difficulties with the following: conflict resolution, ease in asking questions, and heeding nurse input ($p<.001$).[8]

These research findings were supported by a study that compared 15 hospitals in the Western United States. The instrument was not the SAQ, but one developed by the Patient Safety Center of Inquiry at the Veterans Affairs Palo Alto Health Care Systems, from five existing, survey instruments.[9] The researchers assessed the various responses to be either problematic or not problematic. The problematic response rate was 18 percent, which exceed the hypothesized 10 percent problematic-response rate characteristic of high-reliability organizations and also often associated with a strong culture of safety. [9] The sample surveyed in these hospitals included physicians, senior executives, and a random sample of all other employees. An example of a problematic response was the following: "Individuals in my department are willing to report

behavior which is unsafe for patient care." Clinicians reported more problematic responses than senior managers, and nurses were the most negative among the clinician-professional groups.[9]

These results from hospitals in the United States have not been completely replicated in research done abroad. Specifically research reported from four Canadian, university-affiliated ICUs did not find significant differences among professional groups on the overall safety climate, using a shorter version of the SAQ, the Safety Climate Survey, and another tool, the Safety Culture Scale.[4] However, as with studies in the U.S., managers perceived a more positive safety climate than clinical staff. Explanations regarding the differences on the part of the researchers ranged from variations in the design and statistical analysis to the fact that Canada has a universal, healthcare system.[4]

Another major area of literature that is relevant to this publication is that related to the potential impact of age differences in the workplace. A study from England that specifically addressed age differences in the evaluation of safety culture reported their findings from the general perspective of junior and senior staff in the organization, usually meaning the comparison of clinical staff to management personnel. The junior staff consistently evaluated the safety culture to be "less mature" than those more senior, and "*these (differences) seemed to be greater than those between different professional groups*.(emphasis added)" [10] (p.318) The junior staff complained about inconsistent communication from the top down.

When examining the research literature related to comparisons of healthcare professionals, based on age or generational differences, there are published concerns noted within the context of recruitment and retention, particularly in the nursing literature.[11-12] Of particular concern is the belief that the generation Xers (born between 1965 and 1977) will not stay in nursing and are often accused of being arrogant and self-absorbed. The Xers grew up seeing organizations

downsized, reengineered, and their parents laid off. They, therefore, believe that the job market is not reliable; they have less organizational commitment than their older colleagues. [13]

In terms of research regarding physicians and intergenerational differences, an analysis of workloads of general and family practitioners in Canada revealed that these practitioners under the age of 35 provided 18 percent fewer office assessments in 2001 than that same-age group provided in 1992. [14] Also those practitioners aged 35-44 provided 23 percent fewer office assessments than ten years previously. Additionally across the country, the work week dropped from an average of 38.7 hours per week in 1993 to 35.4 hours in 2003, a decline of 8.5 percent. These drops in the younger groups were compensated by those in the 55-to-64 age group and those 65 and older; both of these physician groups increased their workload.[14] With pending retirements for the older physicians, the authors express concern regarding long-term availability of primary-care services in the Canadian system.

Although a number of different names and dates are used for the different generations, there is general consensus that four distinct generations are currently working together: Traditionals, or the Schwarzkopf Generation, born before 1946; Baby Boomers, born between 1946 and 1964; Generation Xers, born between 1965 and 1977; and Generation Y, born between 1978 and 1989.[15] The majority of the workforce is now made up of the latter two age groups combined.

Gen Xers experienced very different personal and professional realities from their Boomer parents. Their experiences growing up as a generation included the highest parental divorce rates, highest child-poverty rates, and the most permissive parenting.[15] From the perspective of the workplace, the Gen Xers were the first generation to experience and compete in a highly interconnected, technologically sophisticated, global market driven by information and knowledge. They also saw companies downsize, reengineer, and lay people off. [15] In response

to the charge that they are not willing to work hard, Gen Xers say they are willing, but they don't want to work seventy hours for only forty hours of pay.[16] (p.126) Gen Xers are looking for coaching-style managers, wise mentors, and competent leaders who can offer them the kind of development in transferable skills that they cannot get from technology. [15]

Generation Y, as in Y follows X, are also called the Millennials, Echo Boomers, or the Nexters. They know far more about the Internet and digital technology than their parents.[16] In the work force, this digital generation is ready to learn anywhere, anytime, and they are credited with being great team players.[15] In addition they are eager to find meaningful jobs, work with knowledgeable, dedicated coworkers, and earn a lot of money early in their careers.[15]

Nexters desire to work for organizations that are dedicated to training and development. And job security means believing they can find another job easily once the current one stops providing opportunities to learn; they don't want jobs to be dead ends. Finally the Nexters have high expectations of managers: the mangers should be open to receiving feedback, have respect for Nexters' opinions, and display the interpersonal style of a colleague rather than a boss.[15] Feedback should be constructive and frequent.

Although research has been done on the culture of safety in Department of Defense military treatment facilities, there is no research that specifically targets primary-care, professional groups in the subset, the U.S. Air Force, using an established safety-climate instrument. Some specific research questions are the following: Is there a difference in safety-climate scores among the primary-care, professional groups of physicians, nurses, nurse practitioners, physician assistants, and technicians (nursing assistants) in terms of the total safety score and the six subscales of the Safety Attitudes Questionnaire? Additionally, what differences exist regarding

safety-climate scores among the different age groups working in primary care in Air Force ambulatory care facilities?

METHODS

Sample

This research targeted all professional, primary-care staff: physicians, nurse practitioners, physician assistants, registered nurses, pharmacists, and technicians working in four Air Force ambulatory-care facilities (also referred to as clinics) in the Midwestern United States. Exclusion criteria included surgical, administrative, and executive-level staff.

The U.S. Military Health System, run by the Department of Defense, is a subset of the U.S. healthcare system that provides inpatient and outpatient services to approximately nine million beneficiaries. These are comprised of active-duty-military members, their families, and retirees and their families. The Air Force Medical Service is a component of the larger, military-health system, caring for beneficiaries in 17 hospitals and 58 clinics. The Air Force Medical Service as a whole has 26,140 outpatient appointments every day.[17] The majority of medical care rendered in Air Force facilities is delivered in ambulatory-care facilities.

The Air Force Medical Service has a category of staff known as nursing technicians, who are comparable to nursing assistants, but they have had greater training. These enlisted members have had six months of didactic training and a year of clinical experience before being assigned to a facility. These technicians continue to advance in their skills by on-the-job training and a series of tests and can, at the more senior levels, give medications; they are a critical component of the healthcare team in the U.S. Air Force. They are comparable to licensed vocational nurses in the civilian, healthcare system.

Instrument

The research instrument utilized was the Safety Attitudes Questionnaire (SAQ). It was chosen for its established use in the research literature, its ambulatory version, and its strong psychometric properties. The SAQ is a refinement of the Intensive Care Unit Management Attitudes Questionnaire and was adapted from an aviation questionnaire.[18] It is a single-page, double-sided questionnaire with 77 total items: 14 questions related to communication and collaboration among professional groups in addition to 63 questions on safety attitudes. The questions related to perceptions of safety use a 1-5-point Likert scale of disagree strongly to agree strongly. A portion (38) of the safety attitudes questions are divided into six subscales measuring the following: Teamwork Climate, Safety Climate, Perception of Management, Job Satisfaction, Working Conditions, and Stress Recognition. Definitions of each of the subscales or factors from the SAQ users' manual, in addition to examples of items, are listed in Table 2.[18] The final section of the instrument has an open-ended question where respondents are asked for three recommendations for improving patient safety in that facility. Previous psychometric evaluations of the SAQ determined Cronbach alphas that ranged from .74 to .93.[18-20]

Data Collection

Surveys were disbursed through a point of contact at each of the four clinics, following Institutional Review Board approval from the U.S. Air Force and the authors' university. All questionnaires included an unmarked, return envelope to maintain anonymity. To encourage participation and achieve a high response rate, the principal investigator traveled to each clinic to answer questions and collect the completed surveys.

Statistical Analysis

A series of analyses of variances (ANOVAs) and multivariate analyses of variance (MANOVAs) were run comparing the six professional groups. In addition, analyses of covariances (ANCOVAs) were computed, controlling for age, years in the clinic of staff members, and years in the specialty profession. To control for familywise, alpha inflation, alpha was set at .03. To analyze the impact of age, ANOVAs and MANOVAs were run, using age banded into three groups (<=31, 32-41, and 42 and over) as the independent variable. The dependent variables included the following: total-weighted, safety-climate score, the scores on each of the six subscales (teamwork climate, safety climate, perception of management, job satisfaction, working conditions, and stress recognition), and the twenty-four questions that were not included in a subscale. The statistics were calculated using SPSS 12.01 (© 2004, SPSS, Inc, Chicago, IL).

RESULTS

All primary care staff were surveyed yielding 213 responses. The high response rate of 65% is attributed to the personal involvement of the researcher in the data collection process. The exact breakdown of the sample is the following: physicians, n=38; registered nurse, n=46; technicians, n=103; physician assistants, n=4; nurse practitioners, n=12; pharmacists, n=10. Complete demographic information on the clinics and respondents appears in Table 1. Cronbach's Alpha, a reliability measure of internal consistency among the scales, was calculated yielding a value of .80, well above the minimum .70 considered desirable. [21]

The professional groups were compared on the total-safety scores and the subscale scores; there was no significant difference on the total-weighted-safety score (p= .154), nor on five of

the six subscales (p values .18 to .48). The professional groups did not differ in the areas of teamwork climate, safety climate, perception of management, job satisfaction, or working conditions. There was a significant difference on the stress recognition subscale, with technicians scoring less than four of the five other professional group (M=53.4, p<.001). See Table 3.

To answer the questions if the difference in total-weighted-safety scores among the professional groups would change after controlling years in the specialty field, years at the facility, and age, three ANCOVAs (analysis of covariances) were computed using these as covariates. The answer to all three questions was no. No significant differences among the six professional groups on the total-safety-climate score persisted after controlling for years in the specialty (p=.287), after controlling for years in the facility (p=.120), nor after controlling for age (p=.272). However, of the three covariates, only age accounted for a statistically significant amount of variation and was a significant covariate (p=.002),

The results do, however, point to differences on safety-climate scores on the basis of age, rather than professional groups. There is a statistically significant difference on the total safety scores and four of the six subscales among the sample on the basis of age. A MANOVA (multivariate analysis of variance) revealed that the less-than-31 group scored significantly lower on total-safety climate [M=64.8; F (2,182)= 10.2, p <001], as compared with the 32-41 group (M=74.3) and the 42-plus group (M=73.8). The less-than-31 group also scored significantly lower on four of the six subscales as well: teamwork climate (p=.002), safety climate (p=.006), perception of management (p=.001), and job satisfaction (p<.001). See Table 4.

How is it that the professional groups do not vary but the age groups are different? An analysis of the groups by age revealed that the groups overlap. The technicians had a mean age of 31.7,

with a range of 19 to 55 years. However, although the physicians had a mean age of 37.7, the range of their ages was 27 to 61 years. The pharmacists also had a similar range. Generally speaking, the physicians and pharmacists, in addition to the technicians, had larger proportions less-than-31-years old in this sample. The registered nurses (M=43.2), nurse practitioners (M=42.8), and physician assistants (44.7) all tended to be older, with mean ages in the mid-forties. Hence age differences crossed professional lines and explain why there can be differences among age groups and no substantial differences among professional groups. See Table 5.

One can raise the same questions regarding confounding influences of years in the specialty and years at the facility as explanations for differences in the age groups, just as one raised those questions for comparisons among the professional groups. Could influences such as years in the specialty or years at the clinic explain the differences among the age groups? Again, the answer regarding confounds was no. Analyses of covariances (ANCOVAs) resulted in similar negative findings for both confounds. In addition, there was no interaction effect between age and years in specialty (p=.759); there was no interaction effect between age and years at the facility (p=.196).

What specifically were the concerns of younger staff related to patient safety? A breakdown of the subscale questions on the SAQ revealed the areas of concern. See Table 6. Specifically these staff from Generation X and Y expressed overall lower job satisfaction and less confidence in management; they also reported concerns about the resolution of disagreements, the flow of timely, adequate information, and the discussion of errors. In terms of these findings in the subscales, the first two items of significant difference came from the

teamwork subscale and are related to the resolution of disagreements and the perception among this younger-age group that nurses and physicians do not work together well as a team.

The second subscale, safety climate, specifically targeted issues with communication, notably question #28, "I know the proper channels to direct questions regarding safety". Although the mean (4.1; $p<.001$) for the youngest-age group was in the positive category of agree, it was less than the other two, older-age groups: 32—41 (M=4.6); 42-63 (M=4.7).

Lack of confidence in management was evident in the results of the third subscale, perception of management. Concerns about the flow of communication with this less-than-31 staff, as compared with the two older groups, were expressed in question #26: "I am provided with adequate information" (M=3.0; $p=.002$).

Finally, the job-satisfaction subscale indicated this younger-age group had a much more negative perception of the office and reported low morale.

DISCUSSION

This study does not support the research findings from inpatient venues of significant differences among professional groups on aspects of safety climate such as teamwork. The professional groups working in primary care in four ambulatory-care facilities showed no significant differences except in the area of stress recognition. The closer working relationship and greater interaction throughout the day that characterize primary-care staff no doubt contributed to similar perceptions of the safety climate. In the category of stress recognition, which measures sensitivity to fatigue and one's recognition of the impact of fatigue on performance, only the youngest group (technicians) reported significantly lower scores than the other professional groups. Their reported sense of imperviousness can possibly be explained by their age.

Why does it matter that the younger members of an ambulatory care staff perceive that they do not get sufficient information, do not know the proper channels to use to express their concerns, and also believe it is difficult to speak up regarding errors? When communication and handoffs break down among the various team members, disruptions in care and negative outcomes occur.

This was evident in a random study of 1452 closed malpractice claim files from 5 insurers between 2002 and 2004, looking specifically for errors associated with trainees, defined as residents, interns, and fellows. The major contributing factors identified were errors in judgment, teamwork breakdowns, and lack of technical competence.[22] Teamwork problems included communication breakdown, supervision, handoff issues, conflict among clinical staff, and failures to clearly specify responsibilities. These teamwork-related factors were involved in 70% of the errors. Although the researchers specify that these handoff problems were most common between trainees and attending physicians, a quarter of the breakdowns in communication involved nurses, pharmacy and laboratory staff, and entities outside the trainee's specific institution. An editorial in the same edition noted that a new model for inpatient care in the 21st century is needed, specifically consisting of teams that include house officers, hospitalists, and nursing staff—all of whom care for the patient from admission to discharge.[23] The value of the team is emerging as a key component in safety, according to Lucian Leape, imminent scholar on matters related to patient safety.[24]

Research that targets the needs of Gen Xers and the Nexters point to solutions for these age groups. Part of the answer, which could come as no surprise, should be technological. The answers to questions, particularly such precise ones related to the proper channels to use to report concerns with error, should be available on line. These answers should be easily accessible and

comprehensive in the guidance they provide. In fact, a Gen X or Nexter should probably design the safety web site for the institution.

However, in addition to high-tech answers, there should also be high-touch solutions as well. Experts are unequivocal in their call for strong training departments, plus coaching and mentoring programs that connect these younger staff with older staff, both clinical and management.[15-16,25]

Conclusion

This study could certainly be replicated in Army and Navy ambulatory care facilities, as well as other civilian ambulatory care venues. In terms of policy development, the increasing emphasis on teamwork in healthcare should inform an appreciation for developing strategies and interventions that target the younger professional staff.

Such efforts with training and mentoring add specificity to the general call for improved communication between management and those directly involved in patient in order to improve the culture of safety.[4,9] There is much at stake; it is not just recruitment and retention. Patient safety is at stake. Not only do all involved with healthcare want to retain these critical Gen X and Nexter professionals in our institutions, it is crucial to make sure that the young radiology technician speaks up to the older emergency-room physician, for the sake of the patient with the fractured hip.

TABLE 1: Descriptions of Participating Ambulatory Care Facilities

	Clinic 1 n = 28	**Clinic 2 n = 42**	**Clinic 3 n = 95**	**Clinic 4 n=48**	**Total n= 213**
Respondent Roles					
Physician	4	4	25	5	38
Nurse	7	8	20	11	46
Technician (Certified Nurse Assistant)	14	23	41	25	103
Physician Assistant	1	1	0	2	4
Nurse Practitioner	1	4	5	2	12
Pharmacist	1	2	4	3	10
Response Rate	46%	82%	62%	74%	65%
Facility Characteristics					
Annual Operating Budget (in million $)	$8.7	$8.8	$32.9	$8.5	$58.9
Patients Enrolled to Facility	11, 055	11,639	29,977	11,000	63,671
Outpatient Visits in 2006 (not dental)	48,864	34,751	165,480	50,158	299,253

TABLE 2: Safety Attitudes Questionnaire: Ambulatory Version Subscales, Examples [18]

SUBSCALE (FACTOR) DEFINITIONS	EXAMPLE ITEMS
***Teamwork climate*: perceived quality of collaboration between personnel (6 items)**	♦ **Disagreements in this office are resolved appropriately (not who is right, but what is right for the patient)** ♦ **The physicians and nurses work together as a well-coordinated team**
***Job Satisfaction;* Positivity about the work experience (5 items)**	♦ **I like my job** ♦ **Morale in this office is high**
***Perceptions of management*: approval of managerial action (5 items)**	♦ **Senior management in this office is doing a good job** ♦ **I am provided with adequate, timely information about events in the office that might affect my work**
***Safety Climate:* Perceptions of a strong and proactive organizational commitment to safety (7 items)**	♦ **I would feel safe being treated here as a patient** ♦ **Medical errors are handled appropriately in this office**
***Working Conditions:* Perceived quality of the work environment and logistical support (9 items)**	♦ **The levels of staffing in this office are sufficient to handle the number of patients** ♦ **Trainees in my discipline are adequately supervised**
***Stress Recognition:* Acknowledgement of how performance is influenced by stressors (6 items)**	♦ **I am less effective at work when fatigued** ♦ **I have made errors that had the potential to harm patients**

TABLE 3: Comparisons of Professional Groups on SAQ total safety climate score and subscales showing Means and (SD).

	Physicians n=39	RN* n=46	Technicians* n=99	PA* n=3	NP* n=12	Pharm* n=10	Total N=210
Total Weighted Safety	**70.0** (±16.2)	**71.5** (±13.4)	**68.7** (±13.7)	**62.1** (±7.8)	**74.0** (±12.3)	**80.0** ± 11.1	**70.2** ±14.0
Subscales							
Teamwork Climate	**70.7** ± 21.7	**72.8** ± 21.0	**67.0** ±18.3	**54.2** ±4.2	**74.2** ± 16.5	**77.9** ±11.1	**69.7** ±19.3
Safety Climate	**78.7** ± 19.1	**79.4** ±14.2	**80.8** ±14.5	**65.5** ± 14.9	**83.6** ±16.1	**83.6** ±10.8	**80.2** ±15.3
Perceptions of Management	**73.0** ±23.5	**75.2** ± 19.5	**72.9** ± 20.4	**61.7** ± 14.4	**74.1** ±20.7	**86.5** ± 15.3	**74.0** ±20.6
Job Satisfaction	**64.4** ±27.9	**70.4** ±22.2	**65.7** ± 24.8	**56.7** ± 40.1	**65.8** ±22.2	**81.5** ±23.6	**67.1** ±24.9
Working Conditions	**63.8** ± 19.2	**68.6** ±16.1	**69.4** ± 17.4	**59.3** ± 12.5	**68.5** ±11.8	**74.4** ± 16.9	**68.2** ±17.2
Stress Recognition	**68.2** ±20.7	**62.0** ±21.8	**53.4 **** ±18.1	**75.0** ±18.2	**69.8** ±14.0	**78.3** ±17.7	**60.5** ±20.5

*** RN=Registered Nurses; Technicians=Nursing Assistants; PA=Physician Assistants; Pharm=Pharmacists**

**** Only significant difference at p=.03 among the professional groups are the technicians in the subscale of stress recognition. This group differs significantly from all others except the physician assistants**

TABLE 4: Comparison of Safety Attitudes Questionnaire total weighted safety and subscale scores by primary care staff, according to age

	< = 31 n = 64	32-41 n=64	42-63 n=57	Total n= 185
Total Weighted Safety Score	**64.8*** ± 14.4	**74.3** ± 11.8	**73.8** ±13.5	**70.8** ±13.9
Subscales				
Teamwork Climate	**63.8 *** ±19.8	**74.9** ± 17.2	**73.4** ± 18.2	**70.6** ± 19.0
Safety Climate	**76.0 *** ± 17.1	**84.3** ±13.7	**82.5** ± 14.0	**80.9** ± 15.4
Perception of Management	**67.2 *** ±21.9	**80.5** ± 18.2	**77.8** ± 19.8	**75.1** ± 20.8
Job Satisfaction	**58.2 *** ±26.5	**72.3** ±20.5	**74.7** ± 23.4	**68.1** ± 24.6
Working Conditions	**65.1** ± 18.7	**70.8** ±16.4	**71.2** ± 15.1	**69.0** ± 17.0
Stress Recognition	**55.8** ± 19.6	**63.7** ± 21.0	**63.8** ± 20.1	**61.0** ± 20.5

*** The less than 31-age group scored significantly lower than the other two age groups on total safety score and on 4 out of 6 subscales at the p<.03 level.**

TABLE 5: Comparison of professional groups on the basis of age (Total N =192)

	< = 31	32--41	42 +	Total N	Mean	Minimum	Maximum
Physician (MD) *	10 (27%)	17 (46%)	10 (27%)	37	37.7	27	61
Registered Nurse	2 (5%)	14 (35%_	24 (60%)	40	43.2	29	63
Technician **	50 (56%)	25 (28%)	15 (17%)	90	31.7	19	55
Physician Assistant	0	2 (67%)	1 (33%)	3	44.7	39	56
Nurse Practitioner	0	5 (42%)	7 (58%)	12	42.8	37	51
Pharmacist	3 (30%	3 (30%)	4 (40%)	10	37.8	24	58
TOTAL	65 (34%)	66 (34%)	61 (32%)	192	36.4	19	63

*** Physicians (MDs) are significantly younger than nurses (RNs) at the p< .03 level**

**** Technicians are significantly younger than all other professional groups except pharmacists at the p< .03 level**

TABLE 6: Comparisons of questions from Safety Attitudes Questionnaire Subscales (Mean ± Standard Deviation) for which the less-than-31 differ significantly

	Age 31 or less n=64	Age 32-41 n=64	Age 42-63 n=57
Teamwork Subscale (#30,38)			
#30 Disagreements are resolved appropriately	**3.4 ± 1.3***	**4.0 ±1.1**	**3.8±1.1**
#38 Physicians & nurses work together as a team	**3.7 ± 1.2***	**4.2±.8**	**4.0±.9**
Safety Climate Subscale (#28)			
#28 I know the proper channels to direct questions regarding patient safety	**4.1 ± 1.0***	**4.6 ± .7**	**4.7± .62**
Perception of Management Subscale (#9, 17, 26, 45)			
# 9 Senior management of this office is doing a good job	**3. 4 ± 1.4***	**4.0 ±1.2**	**3.9±1.2**
#17 The management does not knowingly compromise the safety of patients.	**3.4 ± 1.3***	**4.5 ±1.0**	**4.6 ± .9**
#26 I am provided with adequate, timely information about events that might affect my work	**3.0 ± 1.1***	**3.8 ±1.1**	**3.4 ±1.1**
#45 Attending physicians/primary care providers in this office are doing a good job	**4.1 ± 1.1***	**4.6 ± .8**	**4.5 ± .7**
Job Satisfaction Subscale			
# 2 I like my job	**3.6 ±1.4***	**4.1±1.1**	**4.4± .9**
#15 This office is a good place to work.	**3.4 ±1.3***	**4.2±1.0**	**4.1±1.1**
29. I am proud to work in this office	**3.6±1.3***	**4.4±.9**	**4.2±1.0**
41. Morale is this office is high.	**2.5±1.3***	**2.8±1.4**	**3.2±1.4**

Questions not categorized (#12)			
#12 In this office it is difficult to discuss errors	2.9±1.3*	2.1±1.2	2.4±1.3

Significant Difference for the less than 31 age group as compared with at least one other age group at the p< .03 level.

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Conflict of interest? There are none

Disclaimer: The views expressed are those of the authors and do not reflect the views of the USUHS, the Department of Defense, or the U.S. Air Force

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>
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> Sincerely,
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   USU WWW Home Page at (location) _____
   Other: _____
6. Manuscript title: Communication & Collaboration: Climate of Patient Safety
7. Intended publication (include organization if appropriate): Quality & Safety in Health Care
8. Required by (publication receipt) date: NA
9. Date submitted for USU approval: 19 Dec 2007

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Enclosure 3

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6. Manuscript title: Inseparable but Explicit: Safety Climate as a SNAPSHOT of Culture in Primary Care
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8. Required by (publication receipt) date: ASAP
9. Date submitted for USU approval: 14 MARCH 2008

CHAIR OR DEPARTMENT HEAD APPROVAL

1. Name: _____
2. School/Department: _____
3. Date: _____
4. ☐ Higher approval/clearance required (for University-, DoD or U.S. Government-level policy, communication systems or weapons issues review*).
   *__Note:__ *It is DoD policy that clearance of information or material shall be granted if classified areas are not jeopardized, and the author accurately portrays official policy, even if the author takes issue with that policy. Material officially representing the view or position of the University, DoD, or the Government is subject to editing or modification by the appropriate approving authority.*

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   _____
   Chair or Department Head Signature/Date

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USUHS Form 5230 (VAM) (10/99)

DEAN APPROVAL

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☑ Dean Approval

Bruce Schanberg 3/20/08
_____
Dean Signature/Date

DIRECTOR, UNIVERSITY AFFAIRS (OUA) ACTION

1. Name: _____
2. Date: _____
3. ☐ USU Approved or
   ☐ DoD approval/clearance required
4. ☐ Submitted to DoD (Health Affairs) on (date): _____
   or
   ☐ Submitted to DoD (Public Affairs) on (date): _____
5. DoD approved/cleared (as written) or ☐ DoD approved/cleared (with changes)
6. DoD clearance/date: _____
7. DoD disapproval/date: _____

CR Sr
_____
Director, OUA Signature/Date

Proposal Submission:

20th Annual National Forum on Quality Improvement in Health Care,
sponsored by the Institute for Healthcare Improvement
8—11 December, 2008; Opryland Resort and Convention Center, Nashville, Tennessee

Submitted on line 19 Feb 08: Present a workshop (60-minute learning sessions)

Title: Patient Safety Climate in Ambulatory Care

Proposal Description (limited to 75 words): Original research involving four Air Force ambulatory care facilities, utilizing the Safety Attitudes Questionnaire. Results indicated that facilities can vary on safety scores and subscales of teamwork and perceptions of management for a variety of reasons. In addition, collaboration and communication among nurses and physicians is more positive than reported in inpatient venues; however, pharmacists are not highly rated, nor do they rate physicians high in these areas.

Lela & Tom Holden

From: <webmaster@ihi.org>
To: <HoldenTL@cox.net>; <HoldenTL@cox.net>
Cc: <tstull@ihi.org>; <ecrites@ihi.org>
Sent: Tuesday, February 19, 2008 9:37 PM
Subject: QFaculty: 2008_12_FORUM : Proposal Uploaded.

A new proposal was uploaded with title = Patient Safety Climate in Ambulatory Care

Uploaded by = Lela Holden

Uploaded datetime = 2/19/2008 9:37:50 PM

AN ANALYSIS OF SEVERAL DIMENSIONS OF PATIENT SAFETY IN AMBULATORY-CARE FACILITIES

UNIFORMED SERVICES UNIVERSITY OF THE HEALTH SCIENCES

GRADUATE SCHOOL OF NURSING

Dissertation Defense

COLONEL LELA M. HOLDEN USAF, NC, MA, MSN

9 APRIL 2008

Dissertation Committee

- PATRICIA HINTON WALKER, PhD, RN, FAAN
  Committee Chair
- DORRAINE WATTS, PhD, RN
- COLLEEN GOODE, PhD, RN, FAAN
- CHRISTINE KASPER, PhD, RN, FAAN, FACSM

Thanks to: ROBERT BIENVENU II, PhD

Background

Studies/publications on patient safety:

- **Harvard medical practice study, 1991**
  - **3.7% patients admitted to non-psychiatric hospitals--1984 experienced adverse event**
- ***To Err is Human,* 2000, IOM report**
  - **Between 48,000 and 98,000 patients die every year as a result of medical error**
  - **"System flaws, no human flaws" (Leape)**

Significance

Most care in US not provided in hospitals:

- **On any one day, 25% Americans visit a physician's office, compared to 8% who are hospitalized; 1% hospitalized in academic centers**
- **Extensive research on errors primarily in academic hospitals**

(Green, et al., 2001)

Military Relevance

Consistent with the objectives of DoD Patient Safety Program which are:

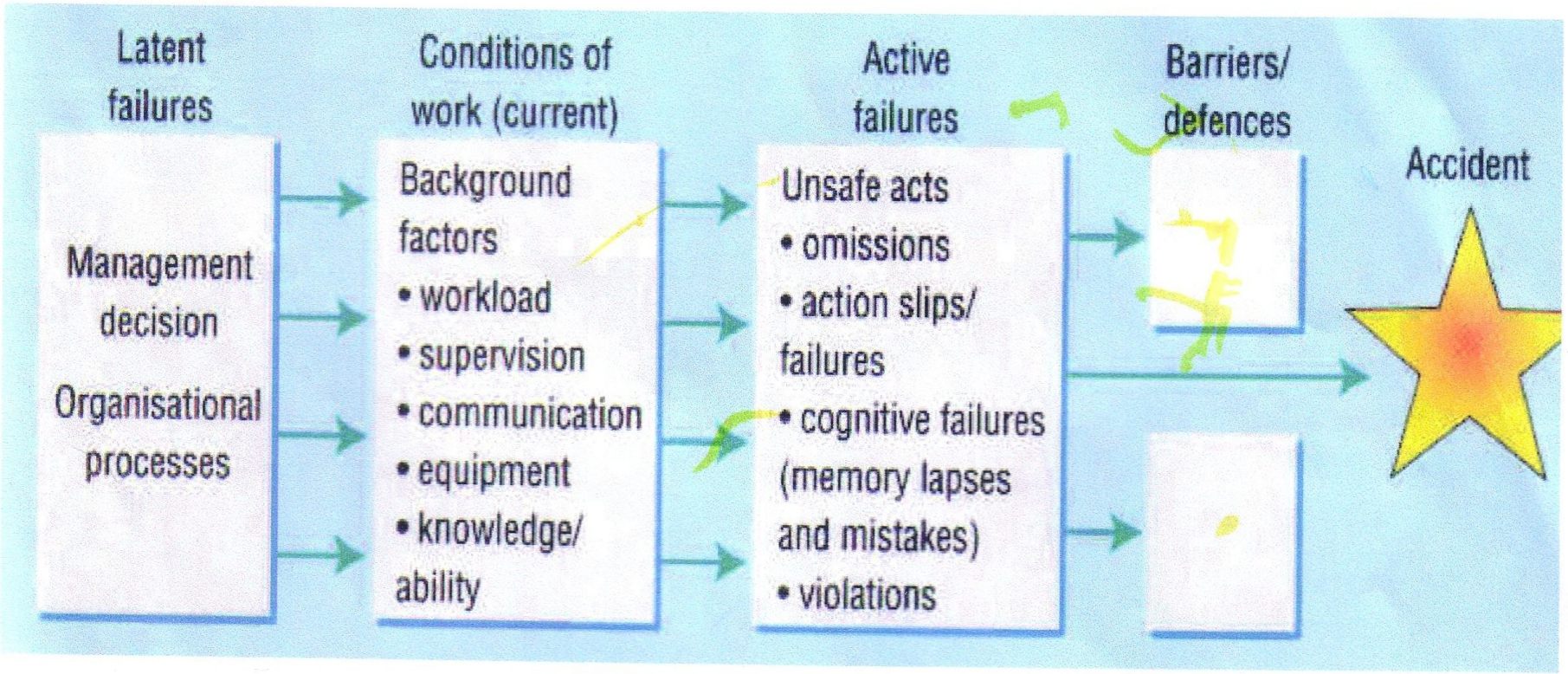
- **Improve coordination of patient safety activities across services**
- **Develop an analysis plan to uncover opportunities for improvement in the military health system**
- **Create a culture of trust in reporting medical errors**

Conceptual Models

A number of approaches

- **James Reason---Most recognized**
  - Active Errors (sharp end) immediate effects
  - Latent errors (blunt end)---lie dormant long time
  - Not unlike resident pathogens in the body become activated and toxic given local triggers

Conceptual Model
Charles Vincent, 1998



Design: Instrument:
Safety Attitudes Questionnaire (SAQ)

- **Rationale**
  - Best instrument to answer research questions - Utilized since 2001, well published
  - Developed at U of Texas Center of Excellence for Patient Safety, Research and Practice - AHRQ grant, 2001
- **Scores: Overall score for Safety Climate**

  Six sub-scales (safety dimensions) scores for:

Teamwork Climate	Job Satisfaction
Safety Climate	Working Conditions
Perceptions of Management	Stress Recognition

  Inter-professional Collaboration and Communication

  Comment Section asking for 3 recommendations

Methodology

- **Design:**
  - Nested design involving multi-sites
- **Setting:**
  - Four free-standing US Air Force ambulatory care facilities in the central US, all part of Air Combat Command
- **Subjects:**
  - Primary Care Staff: MDs, RNs, Nurse Practitioners, Physician Assistants, Pharmacists, and Technicians

Research Questions

- 1. What are the differences among the four Air Force clinics on scores of:
  - a) overall safety climate
  - b) six dimensions of patient safety
- 2. What are the differences among groups of healthcare professionals on scores of:
  - a) overall safety climate
  - b) six dimensions of patient safety
  - c) collaboration & communication

SAMPLE

- **Number of survey respondents by clinic and professional groups**

Respondent Roles	**Clinic 1 n = 28**	**Clinic 2 n = 42**	**Clinic 3 n = 95**	**Clinic 4 n=48**	**Total N= 213**
Physician	4	4	25	5	**38**
Nurse	7	8	20	11	**46**
Technician	14	23	41	25	**103**
Physician Assistant	1	1	0	2	**4**
Nurse Practitioner	1	4	5	2	**12**
Pharmacist	1	2	4	3	**10**
Response Rate	46%	82%	62%	74%	**65%**

RESULTS: Clinic Differences

- **1 a & b. What are the differences among the four Air Force clinics on scores of overall safety climate and on six dimensions (subscales)?**

	Clinic 1 n= 28	Clinic 2 n=42	Clinic 3 n=95	Clinic 4 n=48	Total n=213
Total Safety Score	*80.2*	*65.5**	*69.9**	*68.6 **	*70.2*
Teamwork	78.9	64.5 *	68.9	64.9 *	68.7
Safety	87.9	74.0 *	80.3	78.3 *	79.5
Management	85.7	68.9 *	75.0	67.7*	73.6
Satisfaction	80.6	58.2 *	65.1*	69.7	66.7
Working Conditions	73.7	61.0 *	64.4	70.7	66.0
Stress Recognition	57.9	60.9	62.1	50.0	58.7

* Significant Difference from Clinic 1 at the .03 level using Dunnett-t Post-Hoc

DISCUSSION Research Q 1

- **Individual items making the largest contribution to differences**
  - **Teamwork:**
    Disagreements resolved appropriately (M= 4.25; p =.022)
  - **Perception of Management:**
    Provision of adequate, timely info (M=4.0;p=.027)
  - **Working Conditions:**
    Adequate levels of staff & supervision (M=4.4; p= .004)
- **Responder comments:**
  - **Allotted time for meetings**
  - **Share what is learned from mistakes**
  - **"Stop putting band-aids over personnel problems"**
  - **Reduce turnover, keep in same clinic >2 years**

RESULTS: Professional Groups

- **2 a & b. What are the differences in the professional groups on total score and dimension scores?**

	MD n=38	RN* n=46	Tech n=99	PA n=3	NP n=12	Pharm n=10	Total N=208
Total Safety Score	70.0	71.5	68.7	62.1	74.0	80.0	**70.2**
Teamwork Climate	70.7	72.8	67.0	54.2	74.2	77.9	**69.7**
Safety Climate	78.7	79.4	80.8	65.5	83.6	83.6	**80.2**
Management	73.0	75.2	72.9	61.7	74.1	86.5	**74.0**
Job Satisfaction	64.4	70.4	65.7	56.7	65.8	81.5	**67.1**
Working Conditions	63.8	68.6	69.4	59.3	68.5	74.4	**68.2**
Stress Recognition	68.2	62.0	53.4 *	75.0	69.8	78.3	**60.5**

*Technicians differs significantly from all others groups except the PA's

DISCUSSION: Research Q 2

- Null hypothesis accepted; No difference among groups except stress recognition
- No differences on basis of gender & after controlling for years in the specialty, years in clinic
- Unanticipated finding, based on age: Less-than-31 aged group significantly lower scores on overall safety, 4/6 subscales

RESULTS: Age Groups

- What are the differences in the age groups on total score and subscale scores?

	Age Group			
	< = 31 n = 64	32-41 n=64	42-63 n=57	Total n= 185
Total Safety Score	64.8*	74.3	73.8	**70.8**
Teamwork Climate	63.8 *	74.9	73.4	**70.6**
Safety Climate	76.0 *	84.3	82.5	**80.9**
Management	67.2 *	80.5	77.8	**75.1**
Job Satisfaction	58.2 *	72.3	74.7	**68.1**
Working Conditions	65.1	70.8	71.2	**69.0**
Stress Recognition	55.8	63.7	63.8	**61.0**

* The < 31-age group scored significantly lower than the other two age groups at p<.03.

DISCUSSION: Unanticipated Findings

- Concerns of younger age subjects:
  - lower job satisfaction
  - morale scores
  - difficult to discuss errors
- Possible Implications of these findings:
  - Need for increased training and mentoring
  - Recruitment and retention of younger nurses or health care workers in a time of nursing shortage

RESULTS: Professional Groups

- **2 c. What are the differences in the professional groups on communication and collaboration?**

		Group Being Rated			
		MD	RN	Nurse Practitioner	Pharmacist
Group Performing the Rating	MD	89%	86%	83%	**74%**
	RN	85%	88%	87%	**76%**
	Nurse Practitioner	91%	90%	100%	**90%**
	Pharmacist	60%	70%	90%	**100%**

Cells represent percentage of that professional groups rating the other group high or very high on collaboration and communication

RESULTS: Discussion Q 2
Different Workplace Experiences

Pharmacists Reported:

- Higher support to care for patients (M=4.7;p=.013) compared with MDs (M=3.7)
- Higher morale (M=4.1; p=.008), compared with MDs (M=2.5)
- Knowledge of the names of their co-workers (M= 4.7; p=.003), compared with MDs (M=3.7)
- Made errors that had potential to harm patients (M=3.8; p=.001), compared with MDs (M=3.0)

More adversarial relationship with MDs; “they see us as police not colleagues”

CONTRIBUTIONS TO THE SCIENCE

Significant implications for leaders, policy makers, and those in practice in times of recruitment and retention challenges:

- **Ambulatory-care facilities are different from inpatient units; more positive collaboration and communication among physicians and nurses**
- **Sense of community in ambulatory-care does not extend to pharmacists. Professional groups have different work experiences and world views**
- **Differences among age groups in this sample on safety climate were significant; dearth in the literature with this focus**

Summary

- Limitations
  - Military environment - Air Force Only
  - Sample size
- Future Directions
  - Replicate research in civilian/additional military facilities
  - Greater focus on conflict resolution as an aspect of cultivating safety culture in healthcare facilities
  - Explore opportunities for team-building: target pharmacists, younger staff of all professional groups

PUBLICATIONS: Required for Dissertation with Deliverables

Five Required Manuscripts

- Paper on complex adaptive systems published in *Journal of Advanced Nursing,* Dec 2005
- Manuscript #2 Submitted to *Journal of Nursing Administration*

  Discussion of conceptual models used to evaluate error

  Plans for Revised Submission to *Nursing Administration Quarterly*
- Manuscript #3 Submitted to *Quality & Safety Health Care*

  Comparison professional groups collaboration/communication

  Ambulatory care different from inpatient venues. Revision in progress

PUBLICATIONS: Required for Dissertation with Deliverables

Five Required Manuscripts:

- **Manuscript #4 Submitted to *Military Medicine***
  Comparison of Clinics; Problem resolution critical

- **Manuscript #5 Submitted to *Journal of Patient Safety***
  Comparison professional groups on safety scores and subscales; age matters

Additional Patient Safety Publications During Doctoral Study:

- **Contributor to chapter in Focus on Patient Safety, Volume 24, 2006 Edition of the *Annual Review of Nursing Research***

AIR FORCE

AIM HIGH!

ACKNOWLEDGEMENTS

Comments/Questions?

Uniformed Services University of the Health Sciences
Graduate School of Nursing
PhD Program
Request for Dissertation Defense Date for the
Doctor of Philosophy Degree (Form F_A)

Name of Student: Colonel Lela M. Holden, USAF, NC

Request for doctoral dissertation defense date of the student named above: April 9, 2008

The title of the dissertation is: An Analysis of Several Dimensions of Patient Safety in Ambulatory-Care Facilities

The Majority of the Dissertation Advisory Committee Members are available on this date:

Signature, Chairperson Patricia Hinton Walker, PhD, RN, FAAN — (Yes) or No

Signature, Committee Member Dorraine Watts, PhD, RN — (Yes) or No

Signature, Committee Member Christine Kasper, PhD, RN, FAAN — (Yes) or No

Signature, Committee Member Colleen J. Goode, PhD, RN, FAAN — (Yes) or No

(Approval)/Disapproval

Signature: _____ Date: 4-1-08
Director, Doctoral Program

(Approval)/Disapproval

Signature: _____ Date: 4/9/08
Dean, Graduate School of Nursing, USUHS

Form F_A: Applicable to PhD Students Records from Inaugural to 2006 Entry Class
Supports Doctoral Handbook Policies Prior to the 2007 Handbook

Uniformed Services University of the Health Sciences
Graduate School of Nursing
Report of Dissertation Defense for the
Doctor of Philosophy Degree (Form H_A)

Title of the dissertation: An Analysis of Several Dimensions of Patient Safety in Ambulatory-Care Facilitities

The decision of the Dissertation Committee is:

PASS
A. Both the dissertation and the oral defense are satisfactory: ✓
B. Minor changes are recommended by the Dissertation Advisory Committee that are to be made to the satisfaction of the Dissertation Chairperson: _____

DEFER
A. Major changes in the dissertation are required. Changes must be made to the satisfaction of the Dissertation Chairperson: _____
B. Major changes in the dissertation are required. Changes must be made to the satisfaction of the Dissertation Advisory Committee and at that time the oral defense will be rescheduled: _____

FAIL
Neither the oral performance nor the dissertation are adequate: _____

Signatures of the Committee
Chairperson: _____
Member: _____
Member: _____
Member: _____

Approval/Disapproval
Signature: _____ Date: 4/9/08
Director, Doctoral Program

Approval/Disapproval
Signature: _____ Date: 4/9/08
Dean, Graduate School of Nursing, USUHS

Uniformed Services University of the Health Sciences
Graduate School of Nursing

Certification of Dissertation (Form I)

Name of Student: Colonel Lela M Holden, USAF, NC

This is to certify that the accompanying copies of the doctoral dissertation of the student named above are completed and correct copies as approved by the Dissertation Advisory Committee.

Title of the dissertation: An Analysis of Several Dimensions of Patient Safety in Ambulatory-Care Facilities

Signature, Chairperson Patricia Hinton Walker, PhD, RN, FAAN Date 4/9/08

Approval/Disapproval

Signature: _____ Date: 4/9/08
Director, Doctoral Program

Approval/Disapproval

Signature: _____ Date: 4/9/08
Dean, Graduate School of Nursing, USUHS

Uniformed Services University of the Health Sciences
Graduate School of Nursing

PhD Degree Certification (Form J)

Name of Student: Lela M. Holden

School: Graduate School of Nursing

Degree Date: May 17, 2008

Total Course Units: 79 GPA 4.00

Date passed dissertation proposal oral examination: October 13, 2006
Date passed final dissertation oral defense: April 9, 2008

Date Dissertation accepted by the GSN: April 9, 2008

I certify that the above named student has fulfilled all requirements for the PhD degree.

Patricia Hinton Walker, PhD, RN FAAN 4/9/08
Signature, Chairperson Printed Name Date

Approval/Disapproval
Signature: _____ Date: 4/9/08
Director, Doctoral Program

Approval/Disapproval
Signature: _____ Date: 4/10/08
Dean, Graduate School of Nursing, USUHS

ANNUAL REVIEW OF NURSING RESEARCH

Volume 24, 2006

Focus on Patient Safety

Chapter 1

The Intersection of Patient Safety and Nursing Research

Patricia Hinton Walker, Gaya Carlton, Lela Holden, and Patricia W. Stone

ABSTRACT

The individual and collective discussions of the patient safety issue in the United States have mounted from a low roar to a deafening din in the past 10 years. In this chapter the authors (1) discuss the context of patient safety over the past decade and the federal response to the problem, (2) briefly present Reason's theory of human error, which frames much of the safety research, and (3) provide a glossary of terms.

Keywords: patient safety, nursing

The individual and collective discussions of the patient safety issue in the United States have mounted from a low roar to a deafening din in the past 10 years (Cullen, Bates, & Leape, 2000; Leape, 2005; Leape, 1994). This is fortunate because this complex issue, with its many facets, has considerable human and

financial costs and, as such, can no longer be ignored. In this chapter the authors (1) discuss the context of patient safety over the past 10 years and the federal response to the problem, (2) briefly present Reason's theory of human error, which frames much of the safety research, and (3) provide a glossary of terms.

Federal organizations, including the Institute of Medicine (IOM) and the Agency for Healthcare Research and Quality (AHRQ) (Hickman, Severance, & Feldstein, 2003; Classen, Pestotnik, Evans, Lloyd, & Burke, 1997) as well as the Veterans' Administration and the Department of Defense (2006), are heavily invested in articulating the range of patient safety concerns and identifying solutions. The publications produced in recent years by the IOM in particular formulate a powerful framework from which to investigate patient safety in general and its more precise components (Institute of Medicine, 1996; Institute of Medicine, 2000; Institute of Medicine, 2001; Institute of Medicine, 2004).

The major work that captured the scope of errors and their effect on patients in the United States was the IOM's book *To Err Is Human* (2001), which included reference to the landmark research known as the Harvard Medical Practice Study. This research was the first of its kind to highlight population estimates of adverse events, both unavoidable as well as due to negligence. Researchers conducted a retrospective, random review of 30,121 records from 51 randomly selected acute care, nonpsychiatric hospitals in New York State in 1984. An adverse event was defined as an unintended injury that was caused by medical management and that resulted in measurable disability. The findings were staggering; Adverse events occurred in 3.7% of the hospitalizations, with 1.7% (13,451) resulting in death within New York hospitals in 1984. In addition, 27.6% of the adverse events were evaluated as due to negligence (Brennan & Leape, 1991). These results have been reported extensively in health care literature ever since. However, the actual numbers of deaths related to patient safety errors has been disputed and there are resulting calls for better information systems to help understand the problem more fully (Kopec, Levy, Kabir, Reinharth, & Shagas, 2005). The extrapolation of these results to the more than 33 million admissions in U.S. hospitals implies that tens of thousands die annually from medical errors, which makes it the eighth-leading cause of death, surpassing cancer or motor vehicle accidents (Institute of Medicine, 2000).

Drug-related adverse events were reported in the second part of the Harvard Medical Practice Study (Leape et al., 1991). The incidence of adverse drug events (ADEs) accounted for 19% of the total adverse events, and 18% of that number were considered related to negligence, defined as failure to meet the standard of care reasonably expected of an average physician qualified to take care of the patient. An ADE is defined as an injury resulting from medical intervention involving a drug. In addition, in recent years, the annual deaths associated with medication errors alone was estimated to be 7,391, which

represented a 2.57-fold increase from 1983 to 1993 (Phillips, Christenfeld, & Glynn, 1998).

The IOM's next major publication about patient safety, *Crossing the Quality Chasm* (Institute of Medicine, 2001), again compiled the research data and offered suggestions for finding a way forward. This publication added intensity and focus to the discussion on patient safety by recommending six aims for establishing 21st century health care: safety followed by effective, patient-centered, timely, efficient, and equitable health care. The IOM also stressed that health care should be "evidence-based . . . and systems-oriented" (p. 20). Part of this publication included a comprehensive literature review that captured significant research on topics ranging from immunizations to preventable deaths. The section about ADEs was exemplified by researchers who examined 4,031 adult admissions to two tertiary care hospitals over a 6-month period in a prospective design that compared intensive care units (ICUs) and non-ICUs selected from a stratified random sample (Cullen et al., 1997). The rate of ADEs in ICUs was 19 events per 1,000 patient days, twice as high as the 10 events per 1,000 days in the non-ICUs. These data reinforced earlier research that sicker patients are more likely to experience an ADE (Avorn, 1997).

A third IOM patient safety report directly examined the critical role of nurses in relationship to patient safety (Institute of Medicine, 2004). Nursing actions, such as ongoing assessment of patients' health status, are directly related to better outcomes (Mitchell & Shortell, 1997). Nursing vigilance also defends patients against errors. A study of medication errors in two hospitals over a 6-month period found that nurses were responsible for intercepting 86% of all medication errors made by physicians, pharmacists, and others involved in providing medications for patients before the error reached the patient (Leape et al., 1995). To this end, the IOM concluded that defenses must be created in all organizational components: (1) leadership and management, (2) the workforce, (3) work processes, and (4) organizational culture. Further, there is indication that working conditions that promote patient safety also will provide a safer work environment for employees (DeJoy, Gershon, Murphy, & Wilson, 1996; McGee, 1999; Institute of Medicine, 2000; Lin, Ahern, Gershon, & Grimes, 1998; DeJoy, Searcy, Murphy, & Gershon, 2000). Because the health care workplace has been identified as a high-risk environment, this is an important consideration, and efforts to improve the health and safety of health care workers are needed (Gershon, 1985; Gershon, Vlahov, Kelen, Conrad, & Murphy, 1995; Guastello, Gershon, & Murphy, 1999). In particular, two types of occupational hazards are prevalent in health care workers: musculoskeletal injuries and needlestick injuries (Centers for Disease Control and Prevention, 2000; Stone, 2004).

These reports from the IOM and several significant large-scale descriptive studies, in the early- to mid-1990s, captured the scope and the gravity of the problem of safety. The literature from this period also captured and espoused a

new way of thinking about errors using a systems framework of "no blame, no shame" (Vicente, 2003). The consensus is now strong and passionately expressed that a new paradigm is needed to reduce the tragic cost in human and financial terms of preventable medical errors. Specifically, excessive emphasis on the individual and much less emphasis on the systems components of health care is no longer adequate as a framework for conceptualizing safety and error and especially for finding solutions that work over the long term.

In 2001, the AHRQ was designated by Congress (along with other federal agencies) to provide leadership in implementing the country's research response to the 1999 IOM report on medical errors. As a result of this charge by Congress, AHRQ developed an agenda for patient safety research and has subsequently awarded $50 million in grants, contracts, and other activities for the purpose of reducing medical errors and improving patient safety. This appropriation represents the single largest investment made by the federal government in patient safety (www.ahrq.gov/qual/pscongrpt/psinisum.htm).

Leaders at AHRQ also established a Center for Quality Improvement and Safety that, as a result, has become the leader of patient safety education, dissemination of best practices, and development of standards and measures (Leape, Berwick, & Bates, 2002; Leape & Berwick, 2005). This federal agency was charged with the development of the research agenda and with $50 million in funding made available by the 107th Congress as a response to the IOM report on patient safety, awarded 94 new grants and contracts and conducted other activities to fund research as follows:

- Supporting demonstration projects to report medical errors data—24 projects at $24.7 million for
  —studying different methods of collecting data on errors
  —analyzing data already collected to identify factors that put patients at risk for medical errors
- Using computers and information technology (IT) to prevent medical errors
  —22 projects at $5.3 million for development and testing of the use of computers and IT to
  —reduce medical errors
  —improve patient safety
  —improve quality of care
- Understanding the effect of working conditions on patient safety
  —Eight projects at $3 million to examine how the following affect health care and patient safety:
  —staffing
  —fatigue

—stress
—sleep deprivation
—issues studied in aviation and manufacturing

- Developing innovative approaches to improving patient safety
  —23 projects at $8 million to research and develop
    —innovative approaches to improve patient safety
    —geographically diverse locations across nationwide
- Disseminating research results
  —Seven projects at $2.4 million to
    —educate clinicians and others about the results of patient safety research
    —seek new approaches to improve provider education
    —develop curricula, continuing education, and simulation models
    —provide other provider training strategies
- Additional patient safety research initiatives
  —Remaining $6.4 million for 10 other projects, including
    —supporting meetings of state and local officials
    —advance local patient safety initiative

In each of the succeeding fiscal years since the initial funding, AHRQ continued to devote millions of dollars of its budget to patient safety research, although since 2004 the majority of funds have been earmarked for IT implementation and research.

REASON'S APPROACH FRAMES PATIENT SAFETY RESEARCH

A cognitive psychologist has helped frame and articulate the new paradigm related to patient safety. James Reason added clarity by specifying the differences between slips and lapses and those of mistakes (Reason, 1997; Reason, 1990). The former constitute errors in execution, and the latter are errors in planning. The basic premise of Reason's approach is that humans are fallible and errors are to be expected, even within the best organizations. Errors are viewed as consequences rather than causes having their origins in "upstream" systemic factors rather than in the perversity of human nature. Such systemic factors include recurrent error traps in the workplace and organizational processes that allow error occurrence. Countermeasures are based on the assumption that although human condition cannot be changed, conditions under which humans work can. Central to the system approach is the idea that all hazardous technologies (e.g., airline industry, nuclear plants, space program) employ barriers and safeguards (i.e., system

defenses) against error. When an adverse event occurs, it is important to determine how and why the defenses failed, not who blundered.

Reason illustrated system accidents using a Swiss cheese model where slices of cheese are lined up on a trajectory and represent barriers and safeguards. In an ideal world, each slice would be intact; however, in reality they have many holes continually opening, closing, and shifting location, representing opportunity for error. The presence of holes in any one slice does not usually result in a bad outcome, but when many slices momentarily line up to permit a trajectory of accident opportunity, errors may occur. Holes in the defenses arise for two reasons: active failures and latent conditions. Most adverse events involving a combination of the two. Active failures are defined as unsafe acts committed by people in direct contact with the system or patient and are in the form of slips, lapses, fumbles, mistakes, and procedural violations. Active failures have a direct and generally short-lived effect on the integrity of the defenses or barriers.

In addition, Reason (1997) articulated the difference between active and latent errors, an important distinction that is referenced by those who espouse a systems approach to safety. Active errors are those at the "sharp end" of the system and are the result of actions or violations that have a direct effect and usually in an immediate but short-lived manner. These active errors occur at the human-system interface and tend to be unique to a specific event. By contrast, latent conditions often offer compelling explanation for errors that go beyond issues related to the individual and are part of the system. Latent conditions are defined as inevitable "resident pathogens" within the system. James Reason (1997) explains:

> Latent conditions are to technological organizations what resident pathogens are to the human body. Like pathogens, latent conditions—such as poor design, gaps in supervision, undetected manufacturing defects or maintenance failures, unworkable procedures, clumsy automation, shortfalls in training, less than adequate tools and equipment—may be present for many years before they combine with local circumstances and active failures to penetrate the system's many layers of defenses . . . They arise from strategic and other top-level decisions . . . and the impact of these decisions spreads through the organization, shaping a distinctive corporate culture and creating error-producing factors within individual workplaces. (p. 10)

Errors may arise from decisions made by builders, designers, top level management, and procedural writers. So they may not themselves be mistakes, but all strategic decisions have the potential to introduce pathogens into the system. Latent conditions in turn consist of two kinds of adverse effects: error-provoking conditions within the workplace (e.g., time pressure, fatigue, understaffing, inadequate equipment, inexperience) and long-lasting holes or weaknesses in the defenses (e.g., untrustworthy alarms and indicators, design and construction deficiencies, unworkable procedures). Either of these may lie dormant for years before

combining with active failures to create opportunity for error. Latent conditions can be identified and corrected before adverse events occur, as opposed to active failures, whose forms often are difficult to foresee. This understanding enables proactive management of latent conditions rather than reactive risk management (Reason, 1997).

Reason goes on to explain (1997) that latent conditions are present in all systems and often are related to resource allocation. In addition, latent conditions may lie dormant for a long time until conditions are such that the interaction with local circumstances defeats the organization's defenses and generates errors. Finally, unlike the sharp-end interface with active errors, latent conditions generally arise from the upper echelons and infrastructure of organizations.

The paradigm and mantra of systems thinking now pervade the medical and nursing (Leape & Fromson, 2006; Pape, 2003; Pape, 2001). Researchers built numerous descriptive summaries, poignant anecdotes, and analytical discussions on Reason's work to emphasize that systems failures usually precede medical errors. For example, if two drugs are packaged in an almost identical manner and are placed close to each other, a health care professional will, no doubt, eventually get confused and administer the wrong drug. Such packaging and placement are systems problems. These researchers all advanced the understanding of error in health care from 1990 to the early 2000s. There is broad recognition that errors are an inevitable component of human activities, including health care, and can be managed appropriately even if never eliminated. Learning how to manage errors more appropriately requires acknowledging that medical errors are not the result of ignorance, malice, laziness, or greed on the part of individuals or organizations. If meaningful medical cultural change is to occur, it must be based on the realization that error is a matter of "system flaws, not character flaws" (Leape, 1994, p. 1857).

In summary, the gravity of ADEs has been firmly established in the medical and nursing literature since the early 1990s, and a more sophisticated framework in terms of systems has been implanted. A basic, fundamental groundwork has been laid in the nursing research, even if the designs are not impressive in their rigor. The one study that is quasi-experimental in design is a step forward from the descriptive level of research to identify management interventions that have the potential for improving patient outcomes and safety (Pape, 2001). As always, more information is needed.

GLOSSARY OF PATIENT SAFETY TERMS

As issues related to medical errors are discussed, it is important to have a consistent vocabulary to help health care professionals categorize errors and adverse events. Categorizing and classifying errors and adverse events provides a

structured way to ensure that when anyone talks about an error, he or she is not really discussing an adverse event. To help clarify the need for a structured term set related to patient safety, examine the word "error." Most leading safety experts agree that an error is an unintended act, either of omission or commission, or an act that does not achieve its intended outcome. Not all errors result in an adverse event or injury. For example, a medication may be administered late, but there may not be any negative outcomes for the patient. Therefore, it should not be classified as an ADE.

For data collection purposes and clinical improvement efforts, the categorizing of an error as an adverse event could result in inaccurate data collection. Of more concern is that improvement efforts could be focused on the wrong problem or issues. Clarity and preciseness of terminology and definitions provides a basis for understanding and comparability for clinicians and researchers.

The First Consulting Group has prepared a patient safety glossary in collaboration with the VHA Inc., to help clinicians, researchers, and others understand and use consistent vocabulary related to patient safety issues (Association of peri Operative Registered Nurses, 2006). This vocabulary was developed by patient safety experts and reflects the latest research and expert opinion on the topic and given to the contributing authors of this volume. To conserve space, we have listed only one definition for each term here. Feedback about this vocabulary can be sent to the Association of peri Operative Registered Nurses (research@aorn.org). Those comments, feedback, and suggestions will be provided to the First Consulting Group.

Accident—An event that involves damage to a defined system that disrupts the ongoing or future output of the future.

Active error—An error that occurs at the level of the frontline operator and whose effects are felt almost immediately.

Active failure—An error that is precipitated by the commission of errors and violations. These are difficult to anticipate and have an immediate adverse impact on safety by breaching, bypassing, or disabling existing defenses.

Adverse drug event (ADE)—An injury resulting from the use of a drug.

Adverse drug reaction (ADR)—A response to a drug which is noxious and unintended, and which occurs at doses normally used in man for the prophylaxis, diagnosis, or therapy of disease, or for the modification of physiological function.

Adverse event—An injury caused by medical management rather than the underlying condition of the patient.

Compliance error—Inappropriate resident behavior regarding adherence to a prescribed medication regimen.

Deteriorated drug error—Administration of a medication when the physical or chemical integrity of the dosage form has been compromised, such as expired medications, medications not properly stored, or medications requiring refrigeration that are left out at room temperature.

Dispensing error—The failure to dispense a medication upon physician order (omission error) or within a specified period of time from receipt of the medication order or reorder (time error); dispensing the incorrect drug, dose, dosage form; failure to dispense correct amount of medication; inappropriate, incorrect, or inadequate labeling of medication; incorrect or inappropriate preparation, packaging, or storage of medication prior to dispensing; dispensing of expired, improperly stored, or physically or chemically compromised medications.

Error—The failure of a planned action to be completed as intended (i.e., error of execution) or the use of a wrong plan to achieve an aim (i.e., error of planning).

Error of commission—An error that occurs as a result of an action taken. Examples include when a drug is administered at the wrong time, in the wrong dosage, or using the wrong route; surgeries performed on the wrong side of the body; and transfusion errors involving blood cross-matched for another patient.

Error of omission—An error which occurs as a result of an action not taken, for example, when a delay in performing an indicated cesarean section results in a fetal death, when a nurse omits a dose of a medication that should be administered, or when a patient suicide is associated with a lapse in carrying out frequent patient checks in a psychiatric unit. Errors of omission may or may not lead to adverse outcomes. (Also see "Omission Error.")

Extra dose error—The administration of duplicate doses to a resident or administration of one or more dosage units in addition to those that were ordered. May include administration of a medication dose after the order was discontinued (which also could be considered an "Unauthorized Drug Error").

Injury—Untoward harm occurring to a patient.

Latent error—Errors in the design, organization, training, or maintenance that lead to operator errors and whose effects typically lie dormant in the system for lengthy periods of time.

Latent failure—An error that is precipitated by a consequence of management and organizational processes and poses the greatest danger to complex systems. Latent failures cannot be foreseen but, if detected, they can be corrected before they contribute to mishaps.

Medication error—Any preventable event that may cause or lead to inappropriate medication use or patient harm, while the medication is in the control of the health care professional, patient, or consumer.

Monitoring errors—Failure to review a prescribed regimen for appropriateness, or failure to use appropriate clinical or laboratory data for adequate assessment of resident response to prescribed therapy.

Omission error—The failure to administer an ordered dose to a resident by the time the next dose is due, assuming there has been no prescribing error. Exceptions would include a resident's refusal to take the medication and failure to administer the dose because of recognized contraindications. (Also see "Error of Omission.")

Potential adverse drug event—An incident with potential for injury related to a drug.

Potential adverse event—An error of medical management that does not result in injury ("near misses").

Potential error—A mistake in prescribing, dispensing, or planned medication administration that is detected and corrected through intervention before actual medication administration.

Prescribing error—The inappropriate selection of a drug (based on indication, contraindications, known allergies, existing drug therapy, and other factors); dose; dosage form; quantity; route of administration; concentration; rate of administration; or inappropriate or inadequate instructions for use of a medication ordered by a physician or other authorized prescriber.

Preventable adverse drug event—An ADE due to an error or preventable by any means currently available.

Preventable adverse event—An adverse event attributable to an error.

Safety—Freedom from accidental injury.

Sentinel event—An unexpected occurrence involving death or serious physical or psychological injury, or the risk thereof. Serious injury specifically includes loss of limb or function. The phrase "or the risk thereof" includes any process variation for which a recurrence would carry a significant chance of a serious adverse outcome. Such events are called "sentinel" because they signal the need for immediate investigation and response.

Type A—[ADEs] that are related to a drug's pharmacological characteristics and are usually dose-dependent, predictable, and preventable.

Type B—[ADEs] that are idiosyncratic or allergic in nature and are not dose-dependent or related to a drug's pharmacological characteristics.

Unauthorized drug error—The administration of a medication to a resident for which the physician did not write an order. This category includes a dose given to the wrong resident, dose given that was not ordered, administration of the wrong drug or a discontinued drug, and doses given outside a stated set of clinical parameters or protocols.

Unpreventable adverse drug event—An adverse [drug] event that is not attributable to an error

Unpreventable adverse event—An adverse event that is not attributable to an error.

Wrong administration technique error—Use of an inappropriate procedure or improper technique in the administration of a drug. Examples of wrong technique errors include incorrect manipulation of inhalers, failure to maintain sanitary technique with medications, not wiping an injection site with alcohol, failure to use proper technique when crushing medications, failure to check nasogastric tube placement or flushing NG tube before and after administration of medication, failure to wash hands or improper hand washing technique used.

Wrong dosage form error—The administration of a medication in a dosage form different from the one that was ordered by the prescriber. This could include crushing a tablet prior to administration without an order from the prescriber.

Wrong dose error—When the resident receives an amount of medication that is greater than or less than the amount ordered by the prescriber.

Wrong drug preparation error—A medication incorrectly formulated or manipulated before administration, such as incorrect or inaccurate dilution or reconstitution, failure to shake suspensions, crushing medications that should not be crushed, mixing drugs that are physically or chemically incompatible, and inadequate product packaging.

Wrong rate error—The incorrect rate of administration of a medication to a resident. May occur with intravenous fluids or liquid enteral products.

Wrong route error—The administration of a medication to a resident by a route other than that ordered by the physician or doses administered via the correct route but at the wrong site (eg, left eye instead of right eye).

Wrong time error—The failure to administer a medication to a resident within a predefined interval from its scheduled administration time. This interval should be established by each facility and clearly stated in the facility's policies. Different intervals may be established for different drugs or drug classes, based on the therapeutic importance of dosing.

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